

NATURE MAGAZINE

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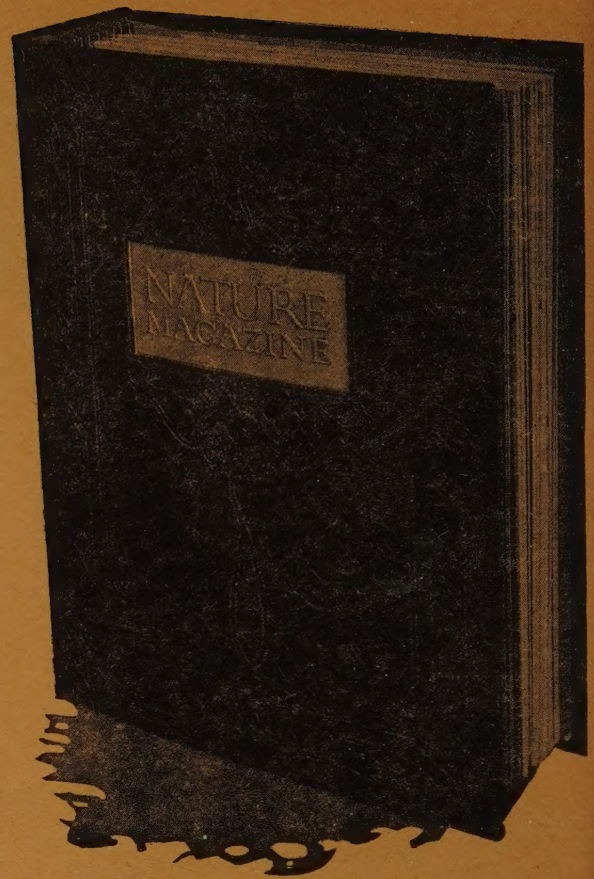


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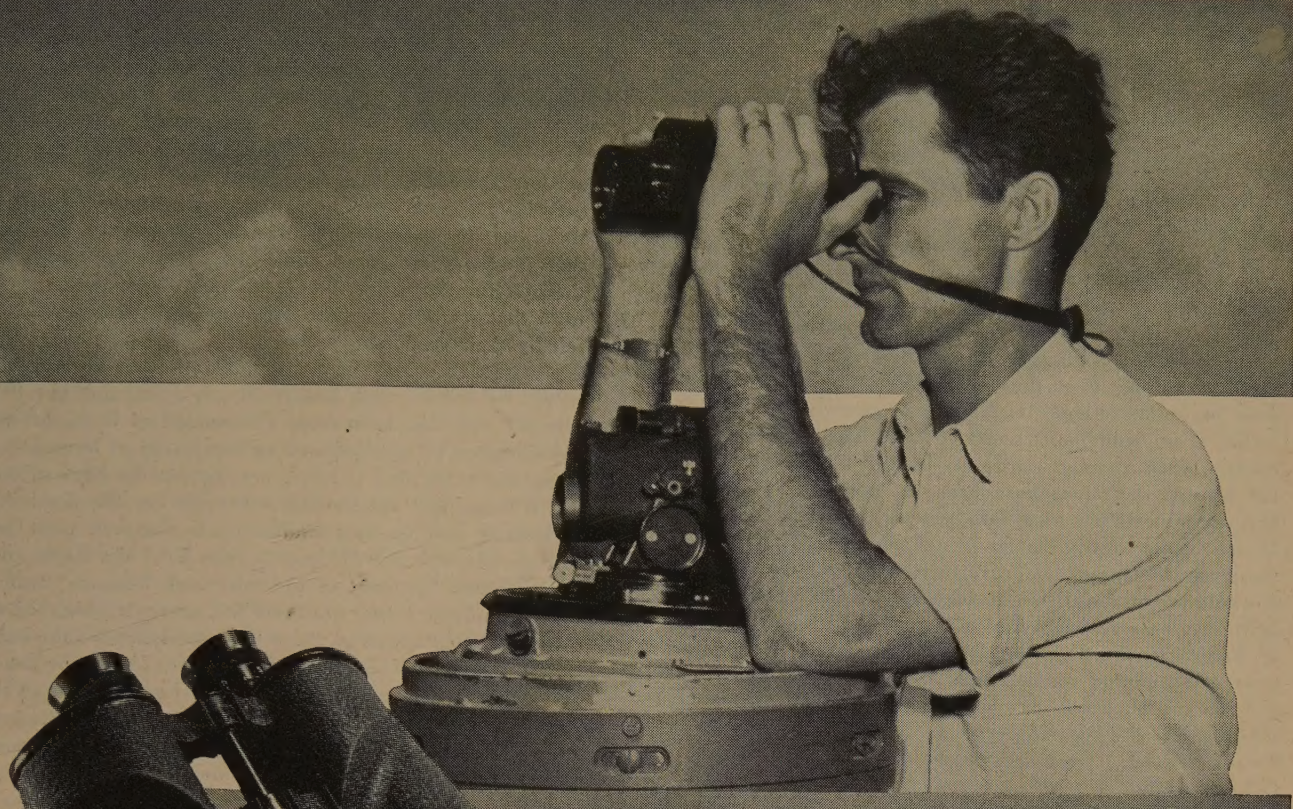
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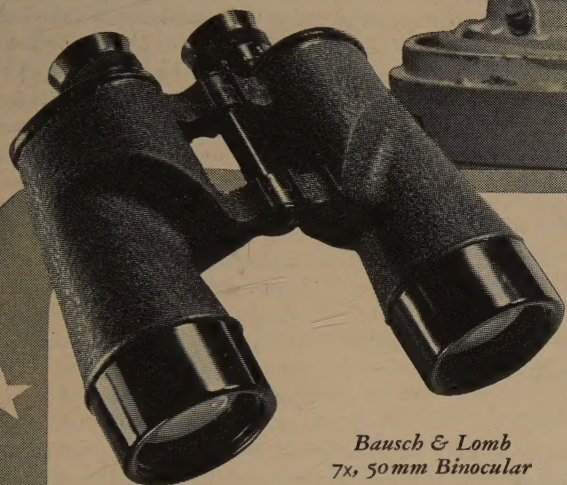
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Nature in Print

By HOWARD ZAHNISER

WILLIAM BEEBE, who himself during the past 40 years has written some 20 works of natural history, has recently accomplished what must be an enjoyably perplexing task in compiling selections from the best natural history writings of all time—from Aristotle's around 344 B.C. to Rachel Carson's in 1941 A.D. Entitled *The Book of Naturalists: An Anthology of the Best Natural History*, the resulting volume is so thoroughly interesting and informative from beginning to end that the always somewhat daring undertaking of an anthologist seems to have been remarkably successful. When a reader can testify that all the known and even the familiar selections have been so interesting as to entice him without deliberation into another re-reading, and when he can further testify that he would not willingly have missed those selections that did prove to be new or unfamiliar—then it would seem that all reasonable expectations from an anthologist have been realized. And so it has been with Beebe's *Book of Naturalists*. Furthermore, the compiler's introductions have proved stimulating and helpfully interpretive yet unobtrusive, and the appended aids to significant reading and further reading have likewise been appreciated. This is indeed a book for which to be thankful.

The naturalists represented are American, British, French, Swiss, Italian, Dutch, German, Greek, Icelandic-Canadian (meaning Stefansson), Roman, and Swedish. The subjects they discuss comprise plants, protozoans, mollusks, arthropods, fishes, amphibians, reptiles, birds, mammals, the evolution of man and his brain, and several general problems such as differences between the sexes, and the aims, adventures, and tribulations of naturalists. As discussed here they carry the reader to various parts of the United States and to the American Tropics, southern South America, Central Africa, North Ireland, England, France, the Himalayas in Asia, the Arctic and Antarctic regions, and even underwater. It is a Whitman's Sampler of the good things that the readers of natural history may have at hand.

And the collection when surveyed leads into a rather satisfying dilemma: Either the subject matter of natural history excites such an interest in details and so stirs the imagination that its writer can hardly escape being interesting, or else a great many of the world's born writers have chosen natural history for their subjects.

Such a collection tempts one to trace through it historical and literary trends in natural history—a temptation that is one of the usual enticements of anthologies. Beginning as it does with Aristotle (although his writings are preceded by reproductions of drawings by pre-historic men), continuing through the writings of those who have described and classified and those who have theorized, and concluding with Rachel Carson, this *Book of Naturalists*, for one example, seems to show a clearly discernible progress right down to the present in the human understanding of other forms of life.

The primary requirement (and one still being met) has been the recording and classifying of the facts about the various forms of life and their relationships to man. *The Wolves of North America*, by Stanley P. Young and Edward A. Goldman, is a very recent example of how this need has been, and is being, met. One has only to pick up this book in the early hours of an evening to discover around midnight how inter-

esting this sort of natural history can be, the clarity and preciseness of Major Goldman's technical descriptions even arousing an interest comparable to that found in Mr. Young's narration, exposition, and collection of lore. Beyond the need for facts, however, in natural history has been the need for understanding—an understanding of how life came to be as it is, and, if possible, why; the sort of understanding that Charles Darwin and Alfred Russel Wallace hoped to bring to their readers, the sort of understanding that T. H. Huxley sought to give his listeners when he spoke "On a Piece of Chalk." And there has also been the need for an expression of the way man feels in the presence of other creatures—the same need that there is for the expression of all man's emotions, the sort of need that was felt by John Muir and John Burroughs, and is felt by their readers.

Mr. Beebe's collection reveals how all these needs have been served by writers, and, historically, it seems that the trend in a broad sense has been from a command of facts, through the apprehension of meanings, to an expression of human feelings. When one reads Miss Carson's writings in *The Book of Naturalists*, it seems that the literature through the aid of science and philosophy and its own tradition has ventured even further.

Under the new title "Odyssey of the Eel," Mr. Beebe presents two chapters, "Journey to the Sea" and "Return," from Miss Carson's volume *Under the Sea-Wind*, through which the reader with the author seems to share the experiences of the eel. Miss Carson defined her aim in the foreword to *Under the Sea-Wind*. "To get the feeling of what it is like to be a creature of the sea

requires the active exercise of the imagination and the temporary abandonment of many human concepts and human yardsticks," she wrote, and "Yet," she pointed out, "if the behavior . . . is to be understandable to us, we must describe it in words that most properly belong to human psychological states." Even an attempt to do this exemplifies a remarkable human understanding of natural history, and success in abiding

by the validity of science and avoiding the irresponsibility of fantasy, while at the same time creating the reality of experience-in-reading seems indeed to be a triumph in literature. "When Anguilla felt the strange eel pushing into the thick mat of dead leaves on the floor of the pool, she moved back into the dark recess behind the waterfall."

Nor is Miss Carson alone in such attempts, other recent examples being enough to arouse at least a suspicion of such a trend in the literature of natural history. Frederic Doyle's achievement in *Smoky Ridge*, published last year by Longmans, Green and Company and reviewed on this page for August-September, was of this order. So also is the newly published *One Day on Beetle Rock*, by Sally Carrighar, an excellent book, satisfying for its beauty and its revelations of natural history, and rich in the sense of participation in the lives of wild creatures that it creates. The publisher describes Sally Carrighar as "writing with the skill of a first-rate novelist and with the accuracy and judgment of a first-rate naturalist," and the comparison with novels in the literature of human affairs suggests in another way the trend in natural history literature here illustrated.

Robert C. Miller, himself an experienced naturalist and Director of the California Academy of Sciences, commends the book in an enthusiastic introductory note, and further defines this sort of writing.

"These are stories of the adventures of animals," Dr. Miller writes, "but with a difference—the stories are of actual animals in an actual place, as the author has observed them. She has watched carefully and reported truthfully, always with sensitive understanding and a keen awareness of beauty. The tales are fiction, yes, but fiction closely parallel with fact. This is real

Animal Anomaly

By H. A. BOLZ

Efficiency's said to be Nature's rote
And balance her regular choice,
But why's the giraffe made to tote such a throat
And yet be devoid of a voice?

natural history."

The day is an eighteenth of June, Beetle Rock a high area in Sequoia National Park, the principal characters a weasel, Sierra grouse, chickadee, black bear, lizard, coyote, deer mouse, Steller jay, and mule deer. In each of ten chapters the reader lives the full day, once with attention on the scene and nine times again through the experiences of a different creature. As in Robert Browning's *The Ring and the Book*, the interest is not alone in each principal character but also in the varying aspects of the same events, and if the pages were hung with some circular device one might go on re-reading until someone would say, "This is where we came in." And as in all literature there is an interest in an effective style of writing.

"The animal sounds," writes Sally Carrighar near the end of her last account of the day, "were the ones that touched the Buck's ears into motion. . . . The Chickaree's claws were catching into the bark as he climbed the fir to his nest; the grouse cock beat a late call; a golden-mantled squirrel barked to summon its young. . . . Distant robins warned that a bear approached. The down of an owl's wings ruffled the air. The flight of uncounted insects blended into a fleshless drone; as a bat pursued them, its snapping mandibles clicked. . . . From a cranny at the Buck's feet came notes like raindrops hanging from the tips of leaves. . . . Suddenly the Buck sprang back. . . ."

It seems safe to say that seldom if ever has one publisher issued almost at the same time two natural history books of greater reading interest than Beebe's *Book of Naturalists* and Sally Carrighar's *Day on Beetle Rock*, and it may be added that not often has a publisher found more appropriate illustrations than those which Henry B. Kane has contributed to Sally Carrighar's book.

The Book of Naturalists: An Anthology of the Best Natural History. By William Beebe. New York: Alfred A. Knopf. 1944. 500 pp., with list selected biological material and 3 reproductions of prehistoric cave paintings of a bison, a wild horse, and a wild boar. \$3.50.

One Day on Beetle Rock. By Sally Carrighar. New York: Alfred A. Knopf. 1944. 196 pp., with end-paper and 20 other illustrations by Henry Bugbee Kane. \$2.75.

Conservation Textbook

Conservation of Natural Resources. By H. Basil Wales and H. O. Lathrop. Chicago. 1944. Laurel Book Company. 554 pages. Illustrated. \$2.00. Discount to schools.

Although the past few years have seen the publication of several excellent books on conservation, relatively little has been done in the way of school textbooks for

students at the junior and senior high school levels. Mr. Wales, member of the U. S. Forest Service staff, and Dr. Lathrop of Illinois State Normal University, have, in their *Conservation of Natural Resources*, done much to fill this gap. They have divided their book into nine units in the following order: History and development of conservation; forest conservation; soil conservation and agriculture; conservation of the range; water resources and their conservation; wildlife conservation; conservation of mineral resources; conservation of recreation, scenic and historical resources; carrying conservation into effect. The development is logical and builds the conservation picture effectively, although we might have expected soil conservation to precede forest conservation. However, one must vouchsafe the forester-author a right to present his major interest first. The text is interestingly written and the illustrations are well chosen. Controversial issues, such as predatory animal control, are treated objectively and fairly.

In their preface the authors state that it is not their purpose "to develop trained conservationists, but rather to give a broad understanding of the program and its application to our everyday living." They express the hope that "students and others who read this book will become *working conservationists* in the sense that they become aware of the soundness of the conservation program, and that they are willing to work and use their influence to promote the idea. It is only in this way that people will learn that the objectives of the conservation movement are calculated for their benefit."

Recently the National Education Association called for the teaching of conservation in the schools and for the immediate preparation of materials for this teaching. Mr. Wales and Dr. Lothrop have admirably anticipated this last demand, and it is to be hoped that their book will enjoy wide school acceptance and use.

Turtle Adventures

The Strange Adventures of Mr. Turtle. By Clarence Hawkes. New York. 1944. Harbinger House. 176 pages. Illustrated by Olga Gnos. \$2.00.

This is the fifty-third published book by Mr. Hawkes, blind Massachusetts naturalist. In it he makes his turtle hero witness the landing of the Pilgrims at Plymouth Rock and follow some of the important events in the development of our country. In the story the author indulges in an anthropomorphic approach and treatment that we do not relish for *Nature Magazine*, but which seems to entertain people in book form. His story is whimsical and interesting, and will be specially enjoyed by young people, who will get some history along with a reading of this tale.



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Devoted to the Practical Conservation of the Great National Resources of America

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February's Authors

Edwin Way Teale is the widely-known author of many Nature articles—the majority on insects—outstanding insect photographer, and the author of several books. He lives at Baldwin, Long Island, not far from his insect garden. . . . Edna H. Evans is a teacher and writer who, with her husband, William J., form a fine team in the field of Nature writing and photography. Bill, currently, is in khaki. . . . Howard J. Shannon is a naturalist with an intimate knowledge of the natural history of Long Island, New York. His *The Book of the Seashore* is a distinguished contribution to Nature literature. . . . Gertrude M. Weber is, as may be gathered from her article, an enthusiastic amateur conchologist. Her home is in Buffalo, New York; her heart on the Florida beaches. . . . Raymond Tift Fuller is a writer-naturalist, author of many Nature books and articles, and a resident of Winterton, New York. . . . Mary Shaub lives in Northampton, Massachusetts, and is an enthusiastic lover of Nature. . . . Paul Churcher is connected with the Department of Nature Study of Cornell University, after having received a medical discharge from the Army. . . . Major Roger Barton is an amateur ornithologist currently in the Army Service Forces and stationed at Picatinny Arsenal, New Jersey. . . . Henry B. Bradford lives in Bethesda, Maryland, and is a retired scientific illustrator.

Chipmunk and Squirrel

The Natural History and Behavior of the Western Chipmunk and the Mantled Ground Squirrel. By Kenneth Gordon. Corvallis, Oregon. 1943. Oregon State College. 104 pages. Illustrated. \$75.

The title that Professor Gordon has chosen for this monograph, in the series published by Oregon State College, is adequately descriptive. It is written for the mammalogist and student of zoology but not in terms that remove from its audience the layman interested in these rodents. Particularly entertaining is the report on various experiments designed to test the ingenuity—dare we say, intelligence?—of the little animals. Some of these tests represent pioneering efforts, and from them the author concedes that the animals are at least persistent. We suspect that he would be ready to credit them with even more distinguished qualities—off the record. To our mind there is more than the usual popular interest in this technical monograph.

Butterfly Collecting

A practical little pamphlet entitled "Starting Your Butterfly Collection" has been prepared by Evelyn Gilstrap. It is designed to be helpful to beginners. The pamphlet is available from the author at Sanitarium, California, for ten cents.

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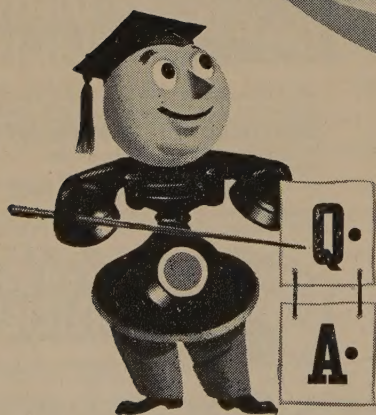
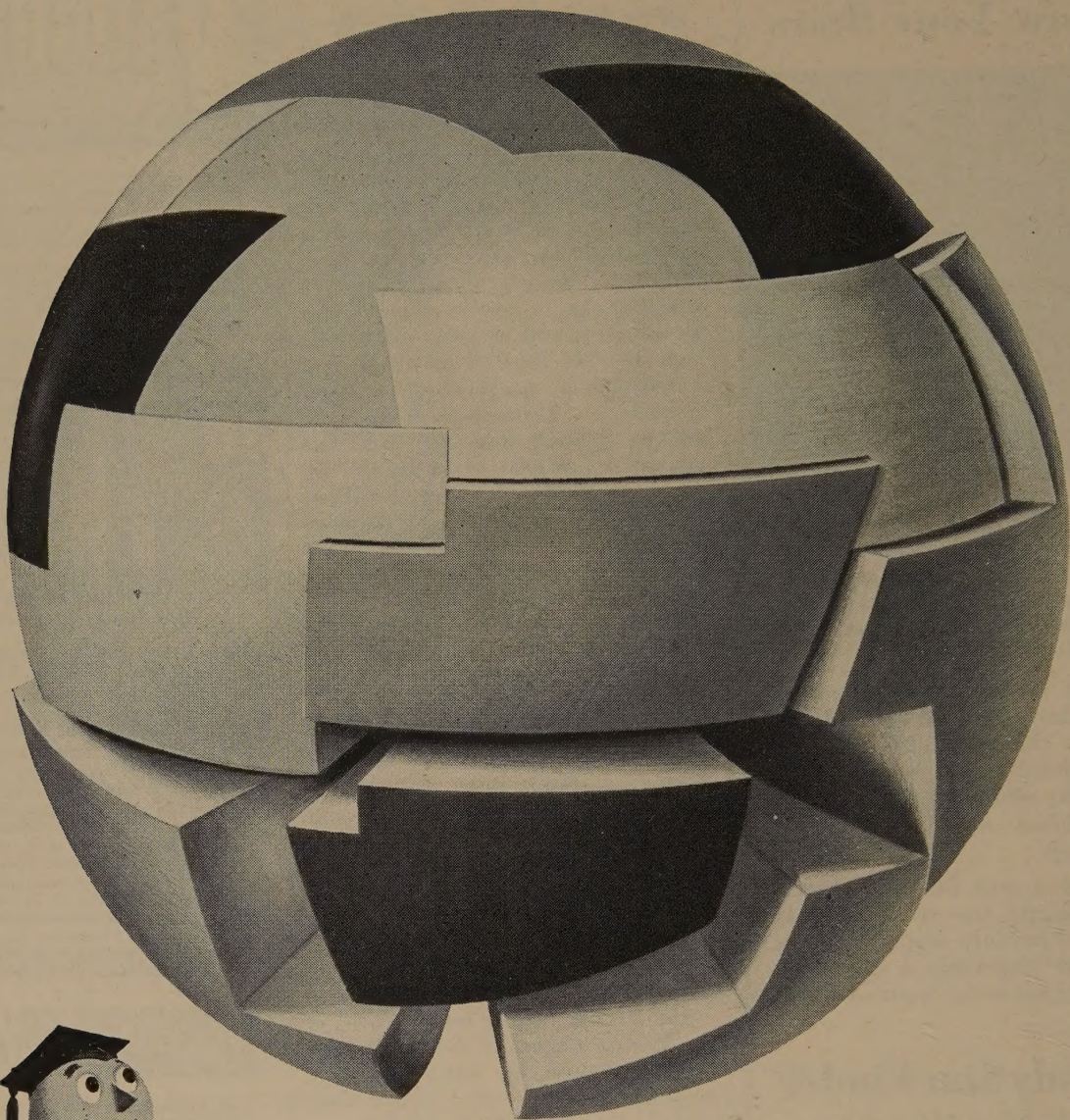
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Contents Noted

In a secret place in our desk we have a copy of the November issue of *Nature Magazine*. So far as we can discover it is the only copy in the office. So we know well why the National Publishers Association urges all us ink-stained editors to urge you, and urge you again, to save paper; turn it in for salvage. They suggest various devices to get the idea over to you. Readers of this magazine are conservationists, so we do not believe they need to be told that the situation is serious. And where we live the school kids almost snatch the morning paper off the breakfast table. But if you have any doubt about the situation, just drop in and try to rifle my desk of that November issue, and see what happens to you.



Dog lovers had some bad moments over a newspaper story that unwanted and surplus dogs of the K-9 corps were going to be sold to the highest bidders. The War Department woke up the next morning with a deluge of protests in its lap, and hastened to say that the story was false; that every effort would be made to return the dogs to the homes from which they had been recruited. However, there are some dogs that have no home to go back to, so Dogs For Defense, which recruited the four-legged soldiers, is going to place them in proper homes. Each applicant for one of these dogs will be carefully investigated, so that each canine veteran will be fitted into the right sort of a home where it can be happy and adjust itself to the ways of peace.

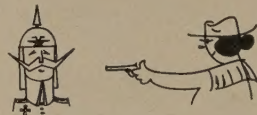


We always find something entertaining in *Zoonooz*, the euphonically titled publication of the Zoological Society of San Diego. Most recently it is the report of the peregrinations of Trudy, the tapir who would not stay put. Trudy had hardly had a chance, after her arrival, to look around her own quarters when she started working out a way to get into the pen of the hippo next to her. She managed it by powerfully spreading the bars and some mighty squeezing, and had to be rescued from two inhospitable hippos who had every intention of reducing the zoo's tapir population by one. Salvaged, Trudy got another pen surrounded by solid fence. One night she was missing, leaving some traces of hide on the wire. Two

days later an hysterical San Diegan reported a rhinoceros in the sewer. An hour's pursuit through underground passages finally achieved her capture. During the weeks that followed Trudy kept on trying to get out again, finally snapping the lock on her door. Soon an indignant woman called the zoo to report some sort of wild animal in her yard, and to say she did not want it there and to come and get it right away. It was Trudy. Now she is back in a pen with every pipe and fence connection strongly reinforced, and with a new and bigger lock. She tried everything before she gave up and reluctantly became a model tapir.



Citizens of Greenville, Ohio, are raising a fund for a monument and a memorial park in memory of Annie Oakley. It is an indication of our ignorance—or our relatively tender years—that we had come to think of an Annie Oakley only as a free pass to the theater, or other divertisement. So we are happy to learn that she was affectionately known as “Little Missy” to Buffalo Bill; as “Little Sure-Shot” to Sitting Bull. From poverty and obscurity she rose to wealth and fame as a deadly shot in Buffalo Bill's Wild West Show. From duck and rabbit hunting in Darke County, Ohio, she rose to dizzy heights, as is indicated by the fact that she shot the ashes from a cigaret held in the mouth of Prince Wilhelm Hohenzollern—Kaiser Wilhelm II to be. Annie led a life noted for her charities and probity, and was buried near her girlhood home of Greenville. How her name got mixed up with free passes we have no notion, nor do we care too much. We hope she gets her memorial park with plenty of carefree squirrels, safe from small boys with air rifles, in the trees.



The billboard industry has long pointed righteously to the fact that it is a part of its “code of ethics” to exclude whiskey advertising from its signs. Now it is writhing because one big distiller—Schenley—has decided that this is foolishness, and its advertising is beginning to appear on twenty-four-sheet posters all over the country. The “unwritten law” of the outdoor advertising industry seems slated to go by the board in the face of this move. Indications are that there will be no official action, code or no code, on the part of the industry itself. As a matter of fact, it seems to be sitting hopefully on its hands—so that it will not be tempted to applaud the Schenley move—and hoping that the public will not object strenuously.

R. W. W.



A saddleback caterpillar, *Sibine stimulea*, on a wild cherry twig. In the inset is the prickly but interesting little larva as seen from the rear. From this point of view its form and markings give it the appearance of the face of a cat.

Travels on a Leaf

The first of a series of new adventures in an Insect Garden

By EDWIN WAY TEALE

Photographs by the Author

A ROBBER fly could wing its way across my Long Island hillside in a single minute. An orange-and-black Monarch butterfly could flutter down its length—from the gray, weatherbeaten barn at the top of the slope, among the ancient apple trees, above the bushes and perennials I have planted to attract the insects, and out over the green expanse of swamp at the foot of the hillside—it could do all this while you are reading but a few hundred words.

Yet, during the eight summers I have been exploring among the insects of this small foothold of earth, I have walked along its grassy, crisscrossing paths a total distance of more than 3000 miles, the equivalent of a trip from coast to coast. Each of these succeeding eight summers has brought its memorable adventures; each has had some new and central attraction. One year, as I related in the book about this insect garden, *Near Horizons*, it was the activity within a forest of cattails; another, the curious events that took place within the darkness of a knothole cavern; another, the drama of life among the Hills of Lilliput on a small stretch of open sand. Last year, during several weeks, travels on a leaf provided a fresh adventure in viewpoint.

Eighty feet or so below the Lincoln Tree, the path to the swamp skirts a small green island of leaves formed by two bushes of wild cherry. In mid-July, both were thatched with the vivid green of their pointed leaves. Yet, in early June, their twigs were bare, stripped by ravenous caterpillars. It was the feeding of these ravenous larvae, one windy day, that first attracted my attention to the clump.

As I walked down the swamp trail that morning, I could see the cattails tumbling in a green surf as the wind rushed over the long sweep of the lowland. Gusts boomed through the tossing branches of the old apple trees, and the pinkish-purple balls of the milkweed blooms gyrated before a Monarch butterfly that tacked this way and that with partially closed wings, flying low and taking advantage of the lee of every bush and tree in an effort to reach the nectar of the flower-masses. The branches of the two wild-cherry bushes were lashing violently about. Their slender leaves were streaming straight out, or fluttering madly, in the grip of the ever-changing gusts.

Yet I noticed that two stout twigs, one from either bush, moved as a single twig. Like clasped hands, they remained solidly in contact. Binding them tightly together was a long, gleaming, silver-white sleeve of silk. This sleeve extended along the twigs for the distance of a foot or more. Bending closer, I saw the explanation, an explanation that opened a window on the profound wisdom of instinct as embodied in even so lowly a creature as a caterpillar.

The home-nest of the larvae shone white in the main crotch of the nearer bush. This bush had been stripped clean of leaves. There was

The larva of the Tiger Swallowtail butterfly on its platform of silk on a wild cherry leaf. Its eye-spots give it the appearance of the head of a green snake among the green leaves when it is at rest.



not a single square inch of leaf-tissue left for the 112 ravenous caterpillars to consume. They had eaten the cupboard bare.

On normal days, in such a situation, the larvae would easily have passed over into the green pastures of the second bush by means of twigs that touched each other at their tips. But today, with the wind beating across the hillside, every twig was a flailing, gyrating, undependable support. The normal procedure was impossible. Each bridge to the other bush constantly was being broken, united, and as quickly broken again. Only by binding the two twigs together could safe passage to and from the other bush be insured. And that is exactly what the larvae had done. With their silk, these lowly engineers had united two twigs to form a safe and durable causeway.

A week or so later, when the whole caterpillar population had disappeared within brown pupal shells for their transformation slumber, new leaves began to push forth on the twigs of the wild cherry. No permanent harm had been done by the ravenous feeding of the crawlers. Each new leaf was green and glistening. Whenever a breeze stirred, it glinted in the sun as though it were coated with varnish.

One leaf, which faced the swamp trail from the tip of a twig, stood out from the others. Watching it, day after day, I became acquainted with the long succession of its transient visitors. This twig-tip leaf took

on a special character of its own as I grew to know it intimately. It became to me a kind of little world; a minute green continent, on which I traveled.

For several days in succession, a frosty-gray robber fly used it for a landing field and lookout perch. With its twelve curving, needle-sharp claws sunk in the tissues of the leaf, it would await, tense and alert, the coming of its prey. Sighting a flying victim, it would shoot away like a rocket, snatch its prey from the air with its talon-like hooks, and return to the leaf. There it would remain motionless in the sun, its terrible hunger momentarily appeased as it drained away the vital juices of its prey.

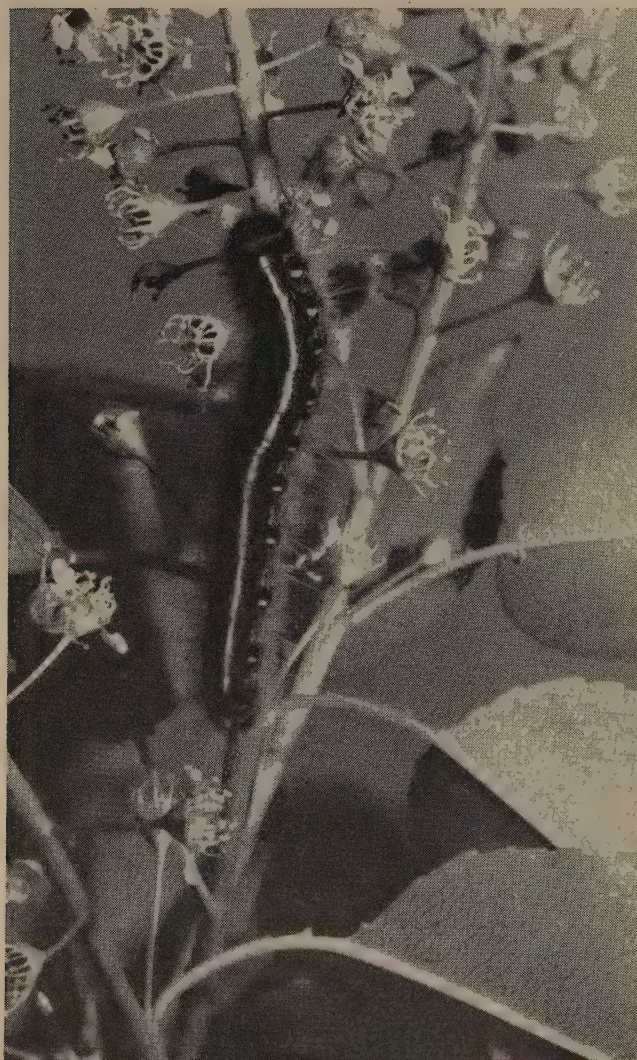
Sometimes, this would be a small fly or a pale-green gnat or a yellow-banded honeybee. Once, it was a dark little insect, which, I saw on bending close, was a winged ant. Its mating flight had come to an abrupt end; the colony it might have established would never be founded. In its turn, the gray robber fly, too, came to a violent end. On one of its rocketing swoops through the air, a still larger robber fly overtook it. In a flash, the hunter became the hunted, the attacker the attacked, the victor of the past the victim of the present.

That robber fly returned no more to the wild-cherry leaf. But there were other flies, of many kinds, that paused for a moment or basked for long periods in the sunshine. Two were startling in their resemblance to aggressive forms of life. One small mimic-fly had the shape and coloring of a wasp. The mimicry extended even to the face of the insect. In common with all flies, it possessed no jaws. Yet fine yellow lines ran down the lower part of its face and gave it the first-glance appearance of possessing the jaws of a wasp. It took a second—and a third—glance to be sure it had only two wings and so could be nothing but a fly.

The other mimic was a small insect with swept-back wings that tilted downward at the back so sharply that their trailing edges nearly touched the surface of the leaf. The broad dark veins of these down-tilted, almost transparent wings resembled the curving, out-spreading legs of a crab spider. With its stubby body and pronounced wing-markings, the little fly, when seen from the rear, resembled surprisingly a crab spider clinging to the leaf.

Other two-winged insects alighted there. Scorpion flies, long-nosed like tapirs and with tail-tips curled upward, would settle down and fold their speckled wings over their backs. One small red fly with a burnished body stands out in my memory. It invariably faced in my direction. One afternoon, I stepped to the right and then to the left twenty times in succession and at each movement the fly, as though con-

A tent caterpillar on a wild cherry in blossom. One hundred and twelve of these larvae ate themselves out of house and home by completely stripping the cherry tree of its foliage.



nected by a piston, swung in my direction. It suggested a soldier on parade, wearing a red uniform and executing a series of rapid about-faces. At each shift in its position, the sunshine flashed in red glintings along the metallic surface of its body.

As a landing field for such insect airmen, the twig-tip leaf provided a constantly changing show. But winged insects were far from the leaf's only visitors. Some of the most interesting were among the lowliest fellow-dwellers in my garden. Oddly-shaped and often colorful, they were those strange, footless children of drab little moths, the larvae that have been lumped together by the scientists under the heading of the Slug Caterpillars.

In some ways, the first one that I encountered on the leaf was the most fantastic of all. I had come down the trail on a stifling afternoon in mid-July. Every leaf on the hillside hung motionless and even the cicadas seemed lost in a siesta. In the intense, sultry quiet, the garden seemed breathing slowly, like a man on the verge of slumber. I paused in the shade beside the wild-cherry leaf. Then I suddenly came awake. Reared above the edge of the leaf there was what appeared to be the face of a tiny cat—its ears pointed, its whiskers spiny, its great staring eyes a vivid shade of green!

The face slowly backed down out of sight below the horizon of the leaf. I peered underneath. A saddle-back caterpillar with bright green markings was adhering to the under side. Seen from the rear, its form and markings gave it an appearance startlingly like that of the face of a crouching kitten.

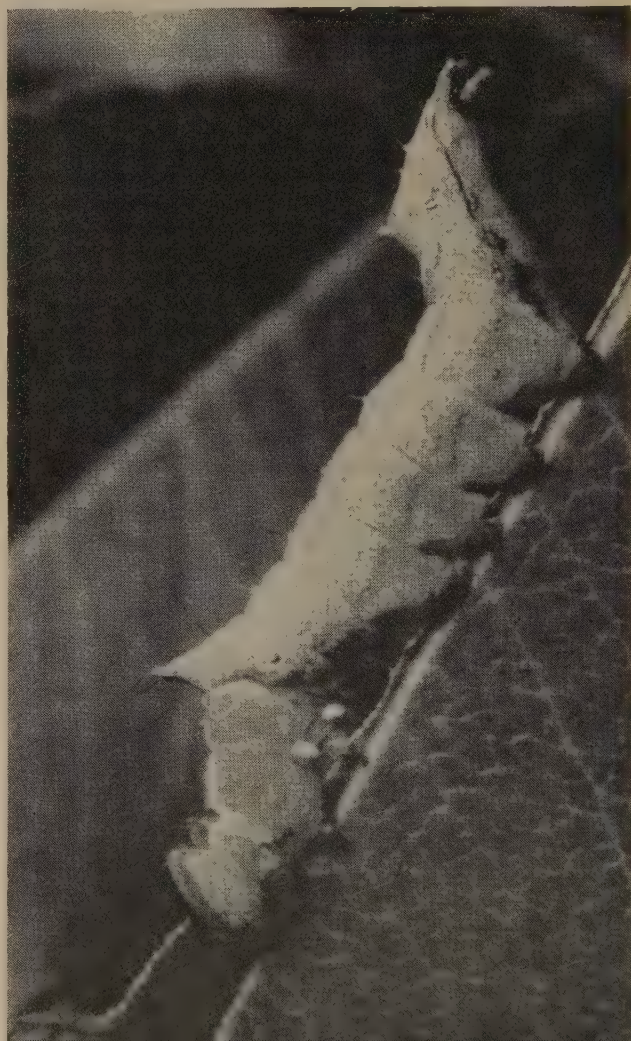
Like other larvae of its kind, this slug caterpillar advances not on feet but—like an endless-tread tractor—on a series of undulating muscles that flow in rhythmic pulsations from front to back along the flat, mucilaginous bottom of its body. Drop a slug caterpillar into a bush or weed clump and it adheres like a drop of glue to the first leaf it touches. When a slug caterpillar moves across a leaf, there is little or no up-and-down motion. It seems to flow across the surface as though riding on ball-bearings. It is Nature's patent model of the caterpillar tractor.

In variety of form, these larvae almost rival the tree-hoppers, those "brownie bugs" of my garden. Some are brilliantly colored with alternating stripes of purple and pink or yellow. Others are almost translucent and suggest, by their shape, minute sea-dollars, laterally compressed. Still others are, to all appearances, merely swellings or galls on the leaves to which they adhere.

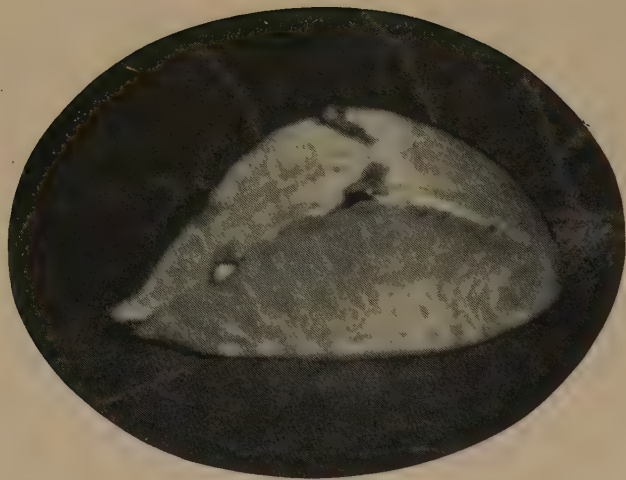
It was one of these latter insects, almost perfectly camouflaged on a wild-cherry leaf, that gave me a glimpse into what must be a great adventure in the

placid life of such a larva. The slug caterpillar, its sides rising vertically and its upper surface streamlined, rested like a miniature tank on the green field of the leaf. As I gazed at it, it appeared slowly to split in two. Stretching out lengthwise, it seemed like an amoeba dividing into two amoebae. The front caterpillar did all the moving, the rear one remaining anchored in place. It was translucent and hollow—the empty skin left behind by the molting larva. The slug caterpillar was in the midst of one of those sudden, dramatic changes that permit it to increase in size.

I watched it move away. Its three-eighths-of-an-inch-long body seemed hardly to warrant its lengthy scientific name—*Eulimocodes scapa*. A few weeks before, it had been a tiny flattened, elliptical egg, transparent and tinted yellow. It had crept from this egg, a minute yellowish creature, which, in time, turned green. At the time of its appearance, it was hardly more than seven one-hundredths of an inch in length. Feeding on leaf tissue, it had grown, increasing its size in a series of molts, until it now was approaching full size. A solitary creature, it went about contained within itself, like a box turtle. This circumscribed existence culminated in the great transformation that turned it into an adult of far different form, into a small, broad-winged drab moth of the night. Eggs that the adults lay start anew the cycle



A camouflaged caterpillar out of its element. On the leaf of a maple it is easily overlooked; on the wild cherry it is conspicuous. Note two white cocoons of parasites on the larva.



One of the slug caterpillars, *Eulimocodes scapa*, adhering to a wild cherry leaf. In the circle the same caterpillar is caught by the camera in the act of shedding its skin.

of slug-caterpillar existence.

As the summer advanced, the edges of the twig-tip leaf became nicked and scalloped by the feeding of small larvae. But it escaped the ravenous jaws of the larger caterpillars. Beyond it, among the hundreds of leaves shingling the forms of the two wild-cherry bushes, humble dwellers of many kinds plied their instinctive skills and used their age-old deceptions to outwit their enemies. In aimless scrawls, those tiny, hidden larvae, the leaf miners, bored their tunnels through the inner tissues without breaking through the surface on either side. There appeared, one day, on the glistening upper surface of one of these neighboring leaves, a shining, silver platform of silk. The leaf had become the home, the base of operations of a strikingly marked caterpillar, the larva of the great Tiger Swallowtail.

Day after day, this larva fed on the wild-cherry leaves—but never on the leaf that was its home. On the silken platform on this leaf it rested when feeding was done, pulling in its head until the fore-part of its body, bearing the immense yellow eye-spots, was swollen and resembled strikingly the head of a green snake among the green leaves. These imitation eyes, a hundred times as big as the real eyes with which the caterpillar sees, help preserve its life during the weeks when caterpillar mortality is greatest.

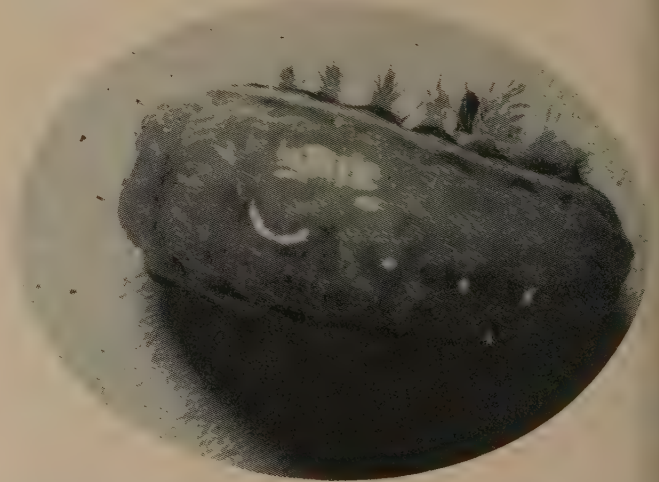
During the latter weeks of summer, when my travels on a leaf were drawing to a close, I spied, among the foliage of the farther bush, another larva. It, too, had form and coloring designed to save its

life. But on the wild-cherry bush the caterpillar was out of place; the very coloring that helped protect it elsewhere made it conspicuous there. Pale green and brown, its back rose in peaks that gave it the appearance of a ragged piece of browning leaf. On a small maple tree, a hundred yards away, I once came upon one of these larvae feeding along the rib of a leaf. Only the closest scrutiny revealed that it was anything but the curled-over edge of a ragged leaf. On the dark green, finely saw-toothed leaves of the wild cherry, however, every passing eye could pick it out. Enemy eyes already had seen it. For, on the side of its neck, the white cocoons of a parasite already had appeared.

Each year, the insect drama of my hillside is a play of three acts: spring, summer, and autumn. By a curious circumstance, as the third act drew on, one of the first wild-cherry leaves in the garden to alter its color was the very twig-tip leaf I had watched so long. Its green disappeared; from stem to tip, it became a

brilliant red. Seen from the path farther up the hillside, it looked like a red gash in the green flank of the wild-cherry clump.

For a long time after this change, and while the leaves around it also were altering their hue, it remained firmly attached to its twig. Late visitors alighted on it. A hover fly basked there in the warmth of midday. There, a mourning cloak butterfly spread its wings in the Indian Summer sun. A yellowjacket, its hunger temporarily satisfied with the winy juice of the (Continued on page 106)



Here, the under side of the slug caterpillar. The muscles, which pulsate from front to back and carry the larva along, are covered with a glue-like secretion that makes it stick.



Heaters flare in a California orchard, seeking to ward off the killing frost, notice of the danger of which has come to the growers from the weather warning service.

*Whole communities in the citrus country
spring to action when the warning comes—*

Frost Danger Tonight

U. S. Weather Bureau Photographs

By EDNA H. EVANS

"CITRUS and truck will not be injured by temperature conditions in prospect tonight," announces the radio in precise, emotionless tones.

But the citrus grower is far from emotionless as he listens. Mentally, he is jumping for joy and cracking his heels together. The golden harvest on his trees is safe for another twenty-four hours.

A few days later the story may be different.

"Clear sky tonight, light northerly winds with long periods of calm," the radio states impressively. "High ground at fifty-foot level two degrees warmer than low ground. Frost deposit at all stations."

Cold chills are skidding down his spine as the grove owner listens. The radio drones on.

"Rapid fall in temperature between 6 and 8 p.m., with steady fall to lowest point at 7:30 a.m. Lowest temperatures tomorrow morning, in coldest low places, fifteen degrees at —"

The grove owner sits as though frozen. The room may be snug and warm, but outside stretch acre after acre of trees, loaded with fruit, some of which is ready for picking. Thousands of dollars' worth of oranges and grapefruit are faced with destruction after sundown. They must be protected.

Protected! The grove owner thaws out in a hurry. Of course, protected. He snaps off the radio and goes into action. Protection is possible—the golden crop is not yet lost.

This grove owner is not the only man alerted. Many citrus men and truck farmers have had their ears glued to the radio, waiting for the regularly scheduled temperature bulletin. Others have scanned the newspapers for warnings, while still others have received the message to prepare for frost via telephone. In some areas messengers are dispatched by motorcycle to carry the word to the remotest regions threatened as the weather man reads the signs of cold.



Thermometer shelters like this are urged by the U. S. Weather Bureau for use in citrus groves. Also the thermometers are checked often for accuracy.

In places where crops are ready to harvest, gangs of workmen go into the fields and groves, hurriedly picking the vegetables and fruit, which are then carried to sheltered warehouses. Where possible, truck farmers cover their young crops with soil. Small oil heaters are brought out to protect mature plants like beans, eggplant and tomatoes. Strawberry growers bring out heaters or cover their plants with pine needles, paper or straw. Citrus men, too, bank their young trees with soil, covering the budded stock above the bud to protect it from the cold.

Citrus growers do not start from scratch in this almost annual battle with the cold. They have been partially prepared since fall. Grove heaters have been set between the rows of trees, the number per acre depending on the type of heater and the fuel used. In heaterless groves, a hundred to a hundred and twenty piles of wood per acre have long been waiting the application of a lighting torch in order to burst into flame and warm the trees around them.

Crews that have been busy fertilizing, cultivating and doing other jobs in the grove are now put to work as frost fighters. Extra help must be hired for the cold spell. In certain areas where help is scarce, the grove man who gets the best supply of labor first has the greatest chance of surviving the cold spell. Late comers, unable to get workers, may be defeated before the battle is started.

In some places, schools are dismissed so the students can help pick the fruit and vegetables that are ready. Women prepare coffee and sandwiches to serve to the frost crews. Everybody goes all-out in the battle against the cold.

Since the Weather Bureau has already announced

An official temperature forecast station in place in a citrus grove. A network of such stations covers the farm areas of the peninsula of Florida, and is a vital part of the system that saves millions of dollars worth of products from destruction by frost.

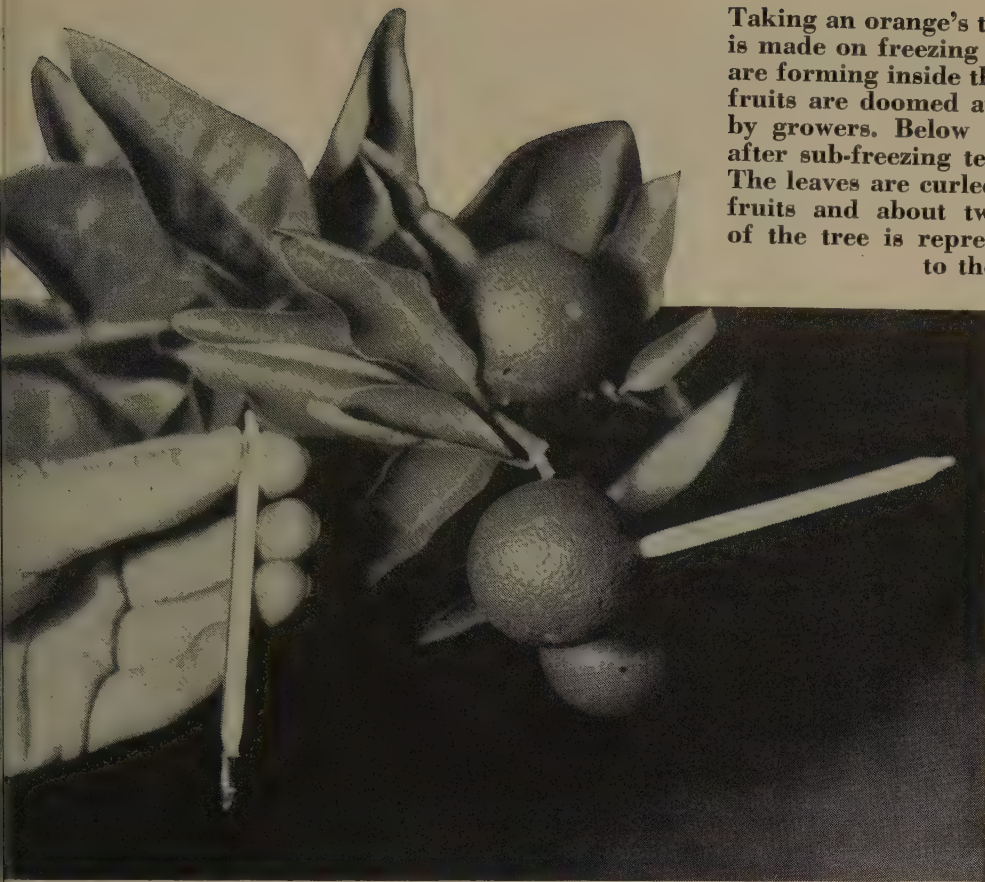
the exact hour when the temperature will begin falling, grove men know just when to begin their labors. As the zero hour approaches—although in this case it is the freezing instead of the zero point that gives the signal—the men get ready for action.

Thermometers in groves are checked constantly as the temperature drops toward the danger point. When the time comes, heaters are lighted, wood fires are kindled, and soon the smoke is rolling upward toward the coldly twinkling stars. Frosty nights are always clear, with the stars like icy points of light in the distance. All night the fires glow between the

tree rows, and thermometers both inside and outside the heated area are checked constantly. On into the wintry daylight the work continues until those thermometers, placed well beyond the warmth from the heaters, indicate that the temperature has risen above danger point again.

Still, the battle may not be over. Often the second night of a freeze is even colder than the first night. The grove men anxiously await the Weather Bureau's next announcement. If this, indeed, warns of further cold, fresh oil supplies must be put in the heaters





Taking an orange's temperature. This is a test that is made on freezing nights to see whether crystals are forming inside the fruit. If this takes place the fruits are doomed and heavy losses are sustained by growers. Below is an orange tree eight days after sub-freezing temperatures struck the grove. The leaves are curled, brown and dry. Loss of the fruits and about twenty-five percent defoliation of the tree is representative of which happened to the whole grove.

case. Nevertheless, grove men must battle the frosts almost every winter, and it is only on rare occasions that they are completely defeated. The fact that the Weather Bureau keeps them informed as to possible freezes is at least one strike in their favor.

All this places a great responsibility on the Weather Bureau. A mistake of even a few degrees, one way or the other, means a loss of thousands of dollars to citrus growers and truck farmers. The prediction of a frost that

and more wood brought for the bonfires. Grove workers can snatch only a few winks of sleep before going back to their labors again.

Sometimes the cold is too intense to be completely defeated. It nips into the groves and ice crystals form inside the fruit. Next day the sun shines clear and bright—it usually does after a frost—and as its rays strike the leaves, they shrivel and blacken. Bark on the tree trunks splits open. The frozen fruit thaws out and begins to spoil. Soon the ground is littered with dead leaves and useless fruit. Grove men must prune their trees ruthlessly to save what wood they can. But even in extreme freezes like this, protected groves are better able to survive and produce fruit the following year than are those which have not been heated.

Fortunately, this type of killing frost does not occur often. This country would have no citrus industry if that were the

fails to materialize means money and time lost in gathering men to fight an enemy that does not arrive. Failure to predict frost, on the other hand, permits the enemy to take the grower by surprise and ruin his crop without giving him the opportunity to defend it.

Citrus growers and truck farmers have learned, from experience, to place reliance in the forecasts of



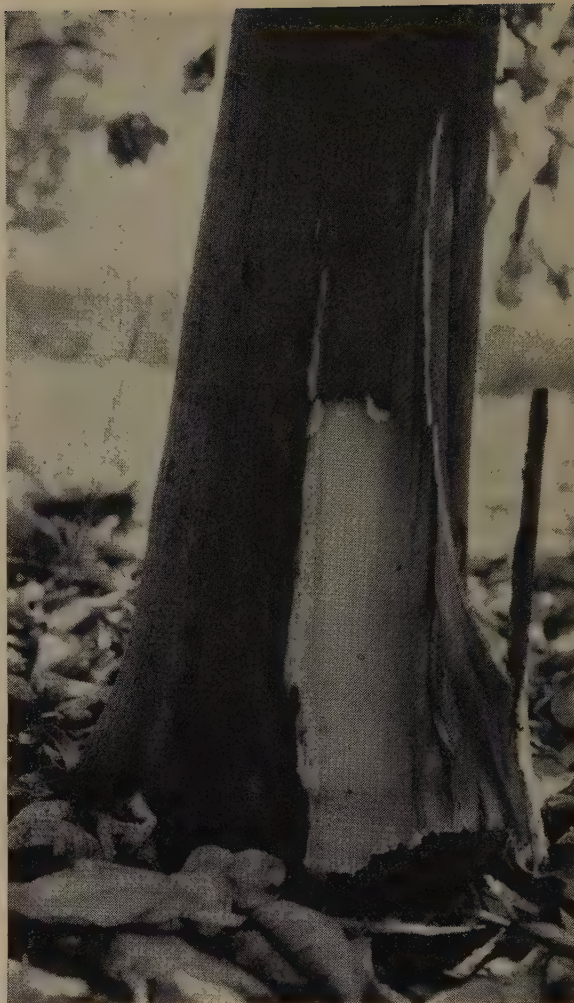
the U. S. Weather Bureau. Its predictions are not often wrong, and the errors are usually so small that wise men listen to its warnings and take heed.

In the northern parts of the United States, frosts are taken for granted. They are annual events, heralding the approach of winter, lingering on through the frozen period, and then retreating again with the coming of spring. But there are portions of the country where the climate is mild enough to permit a winter growing season, and it is for these regions that the Bureau's frost warning system is intended. The service operates in parts of eleven states, with Florida and California comprising the largest areas involved.

Since frosts are more or less local matters, each region has its own particular set-up and operates under the system best suited to that particular state. In California, the Federal Fruit-Frost Warning Service of the U. S. Weather Bureau works in co-operation with the California Fruit Growers' Exchange, with headquarters of the service at Pomona, and with Floyd D. Young as regional director. In Florida the Federal-State Horticultural Protection Service is a cooperative enterprise between the U. S. Weather Bureau and the Agricultural Experiment Station of the University of Florida. Lakeland is state headquarters and Warren O. Johnson, Meteorologist in Charge, issues all frost warnings from there.

Meteorologists are well acquainted with the conditions that bring on a major freeze, for each time events follow much the same pattern. Weather that will ultimately result in a freeze in Florida has its origin over northern Alaska and Canada. When a mass of extremely cold air forms, accompanied by a high barometric pressure, the weather man sees in it the possibility of a severe frost in central Florida.

These polar air masses drift across the country, from west to east, following somewhat erratic courses. While each one is a potential threat to Florida, not every one will swing that far south. Conditions in Florida must pave the way for such a frost invasion. If, at the same time the high pressure area forms in the northwest, an energetic low pressure area forms



This 25-year-old lemon tree was not protected during a cold spell and the cold caused its bark to split open.

over the Gulf of Mexico and moves north and northeast toward the Atlantic, the cold air flows in on the heels of the low pressure area and Florida truck farms and groves suffer.

But even so, to complicate the weather man's predictions, a major freeze is not so likely to occur if the wind continues to blow enough to keep the surface air stirred and thus prevent a large fall of temperature during the night. The weather man must pay close attention to the wind in making his predictions.

If the wind does die out, temperatures that have been uncomfortably low during the day begin to fall rapidly after sundown. They reach damagingly low levels early in the night and remain there for many hours, exposing the truck farms and citrus groves to longer periods of cold than they are able to endure. Such freezes usually last for two days, with the second night even colder than the first.

Thus, even though the conditions causing the great freezes are known and understood, the forecaster must take into consideration many different weather elements before he can make accurate predictions of the cold's arrival and intensity. A single error, even a slight one, in estimating humidity, direction and force of wind, cloudiness or pressure gradients may throw his minimum temperature forecast off by several degrees.

Since citrus fruits are grown in areas that also derive great profits from the winter tourist business, the weather man often finds himself caught between two conflicting forces.

"Tell us the worst," urge the citrus growers. "We want to be ready."

"Don't frighten the tourists away," plead the winter climate boosters. "Give us the highest reading you can."

The latter group is always agitating to have the official thermometer placed in the warmest location possible. A town likes to point with pride at its high winter temperature average, although it neglects to mention that its thermometer is on the top of a building, or in a sheltered place where the recorded temperature is often several (Continued on page 106)



This chestnut tree and scene are eloquent with hidden meanings. Long Island Indians knew this tree. And as the Ojibwas, belonging to the same great Algonkian tribe through the bond of a common language, named the chestnut "kitchijawemin," meaning "great angular fruit," it was possibly known in somewhat similar fashion to our Island Indians.

A Tree as Historian

*And the story that
it told*

By HOWARD J. SHANNON

Illustrated by the Author

How little did I realize what secrets of past life, both human and those of wild nature, were hidden in that scene when, nearly fifty years ago, I settled myself to draw this great chestnut tree! For youth "sees through a glass darkly." It is too engrossed with surface appearances to perceive their underlying significance; indeed, it lacks the required knowledge to realize that such significances exist. So the emotions aroused by form and color are enough. The brilliance of transmitted light streaming through those widespread chestnut leaves, rippling waves of breeze-blown grass along the fields, and the floating wreaths of summer clouds—all these shifting surface-plays over the pleasant face of Nature were sufficient unto themselves. Deeper meanings were ignored. Yet that silent tree was eloquent with hidden

meaning. It was itself both proclaimer of, and a memorial to, the great past changes that had swept over this spot. How did I happen to perceive all this?

Nearly fifty years have passed. This faithful drawing is brought out for reexamination. Suddenly a question arises. Why did the tree bestride this curious ridge, which extends diagonally from the left, supports the tree, and then continues onward into the field? Although overgrown with grass, it is a definite bank from which the land falls away toward the left until it ends at the edge of the pond in the distant hollow beyond the trees. So that was it!

This ridge was the bank of a once larger and more ancient pond that spread its waters here when the tree was young! The pond in the picture is only a shrunken, weedy relict of a much larger expanse of

water that once bathed the very roots of the young chestnut tree itself. Therefore, quite likely, the woodsman had found it more convenient to ignore it when he cleared the forest that once shaded the adjoining field. Those other trees and dogwoods, standing to the right of the chestnut on this same ridge, confirm our interpretation. They, too, or the parental roots from which they sprung, once bordered that larger pond.

Another question arises—why did the pond shrink? Obviously, it shrank because the forest's removal left the soil wholly exposed to the sun, and therefore unable to conserve the excess of moisture, which had previously gathered in the hollow. Gradually, many years before this drawing was made, the waters retreated until a balance was struck between rainfall and evaporation; then the pond's outline became constant. Meanwhile, other trees had sprung up along these newer, more contracted, borders, and waxed strong as we see them at the extreme left. So the landscape stands before us, apparently static, yet full of meaning.

Still another question arises. When did these changes take place? When were the woods cut down—and why?

Probably the cutting took place about the year 1778, when British troops were quartered along these hills during the Revolution. For, according to Onderdonk, these hills were occupied by the "redcoats" during the entire war, and a large quantity of fuel was needed to warm the many huts they built along the south side of these hills. Some of their cellars, appearing like moderate-sized pits, were plainly visible, even as recently as my own youthful days, not many hundred feet from this very tree.

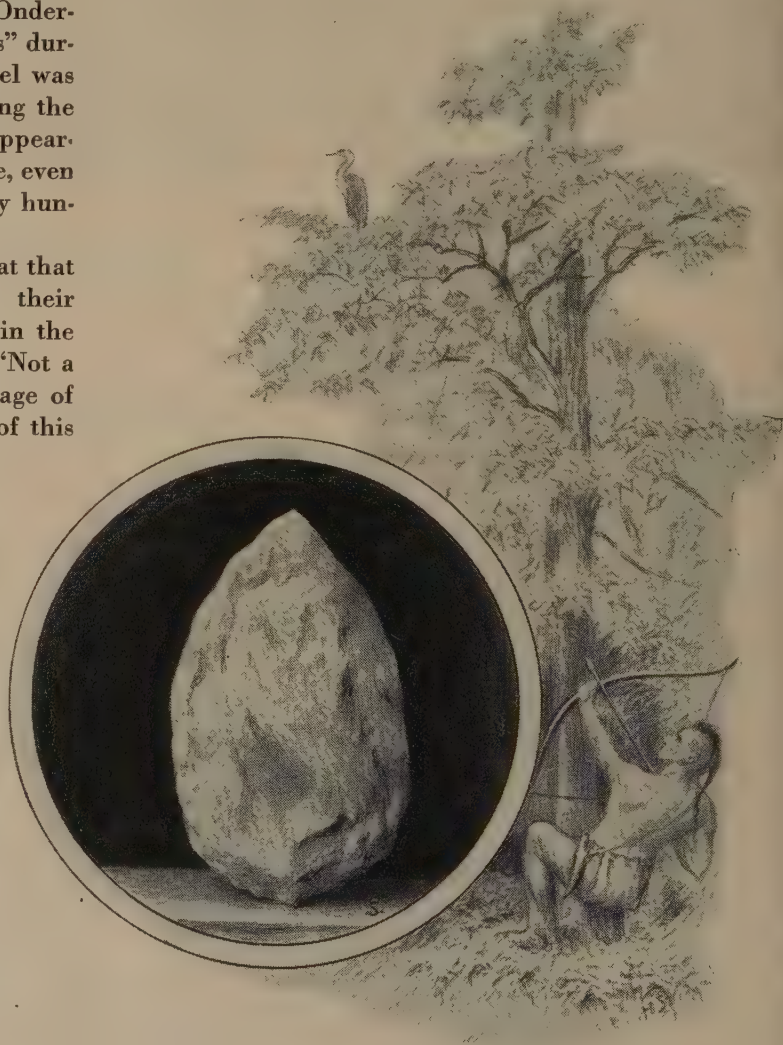
In fact, the requirements for fuel were so great that eventually the farmers hereabouts took up their fences in the fall only to set them out again in the spring, and thus save them from the soldiers. "Not a length of fence," we read, was left in the village of Jamaica, which lies immediately to the south of this tree. On December 22, 1779, a notice appeared informing woodcutters to apply to the innkeeper in the above-mentioned town, where instructions would be given. Moreover, a proclamation by Robertson, a British officer, reads, in part: "The necessity of a seasonable and ample supply of fuel for his Majesty's troops obliges me to call on the inhabitants of Long Island to furnish a proportion of wood, etc. Queens (a county which included this local region) 4,500 cords."

The owners of woodland who were loyal were paid for their wood; those in rebellion suffered confiscation. Walnut and oak are specifically named in the proclamation, which may have been an additional reason for the sparing of our chestnut tree. For the size of this tree in the year 1895, when the drawing was made, indicates that it must

have been in existence during Revolutionary days.

Still more ancient activities have moved about this tree, and left their evidences behind. For one day, after a heavy rain, I paused beneath this tree, and almost rubbed my eyes! There, on the ground, lay an Indian arrowhead carefully and most expertly cut from a piece of stone. Had it been loosed at some water-bird resting in the upper branches of our chestnut, fallen into the water, and therefore been lost to its owner, only to be recovered, more than a hundred years later, when various surface changes brought it into view?

However that may be, we now see, in imagination, the recreated forest itself. Great chestnuts, oaks, maples, walnuts and many other trees clothed these fields, these hollows and rolling hills, to form a woodland world of sober magnificence whose peaceful shades were only occasionally stirred by the cries of wild animals or birds, or by the cautious footfall of the Indian stalking his prey. Comparatively speaking, peace did prevail here, if we except the violent and early tribal wars. For a considerable degree of amity existed between the white settlers and aborigines, only infrequently marred by the bloody conflicts so prevalent in other parts of the country.



According to Dr. Prime, the rights of the Indians were respected on Long Island, as trading for the land became the rule. On Manhattan Island, indeed, the aborigines and settlers lived peaceably until theft, violence and an attempt to tax the Indians brought disillusionment. In fact, some students believe the original owners misunderstood the nature of the negotiations, and thought they were selling only the right to hunt, live upon, and till the land. Power used unwisely aggravated the situation. That same Governor Kieft, who created a rift between the two races on Manhattan, sent an expedition into western Long Island, likewise with deplorable results. Moreover, although a measure of stability was attained and trading became the rule, the payments made to the Indian were so pitifully small, when compared to the rights he relinquished, and were so often possessed of implications he failed to understand, that a profound sense of injustice developed. Undoubtedly, great wrongs were committed, and piously disregarded by the whites. So, of some of these things, too, our noble chestnut tree may have been an unconsidered part—and a silent witness.

Of more violent things, also, this place can tell. And now we plunge more deeply into the past that existed here before the white settlers or even the Indians came; now we consider the true geologic past. For this whole depression in which the tree stands is a glacial hollow, a continuation of a swamp that exists just beyond the farthest trees and, therefore, to the northward—for we are facing north.

From that direction, of course, came the great ice mass of the Glacial Age to bring this very soil of the hollow and the hills all about us. For these are glacier-created hills whose highest elevation hereabouts stands immediately behind us, and represents a local section of the great Long Island terminal

moraine that marks the farthest incursion of the ice in this region. Quite a number of large glacial boulders, showing the effects of water action or surface scorings where other rocks ground their way over them, lie, here and there, upon the hills. Some of them measure more than a dozen feet in length.

Other surface scorings nearby possess an even more specialized meaning. One such ravine lies about nine hundred yards away, where it forms an approximately north to south-trending gash in the hills. It is believed by Professor Woodworth to represent one of the outlets of the great lake which, in glacial time, lay widespread beyond the barrier of these hills. As the melting ice front retreated, the accumulating waters are believed to have found their way southward through these scorings, which represent the beds of the old watercourses. Eight similar troughs have been identified by the above-mentioned writer; they lie at varying intervals between this local ravine northwest of Jamaica and the western extremity of the Island.

Recent excavations along these hills have uncovered interesting stratifications of sand and gravel, some considerably contorted, others only slightly inclined one way or the other, according to the mode of deposition by the water. And all this, of course, determined those conformations of the land we knew as our familiar hills, nor should we forget that this very glacial drift itself provides a soil in which chestnut trees are known to thrive favorably, and therefore provided our silent Teacher with an acceptable home. So we see that even the simplest scene, as well as the more extensive, bears within itself, like the face of man himself, evidences of the vicissitudes through which it has passed because the various creative and moulding forces impress upon it an individual character completely inseparable from its inner history.

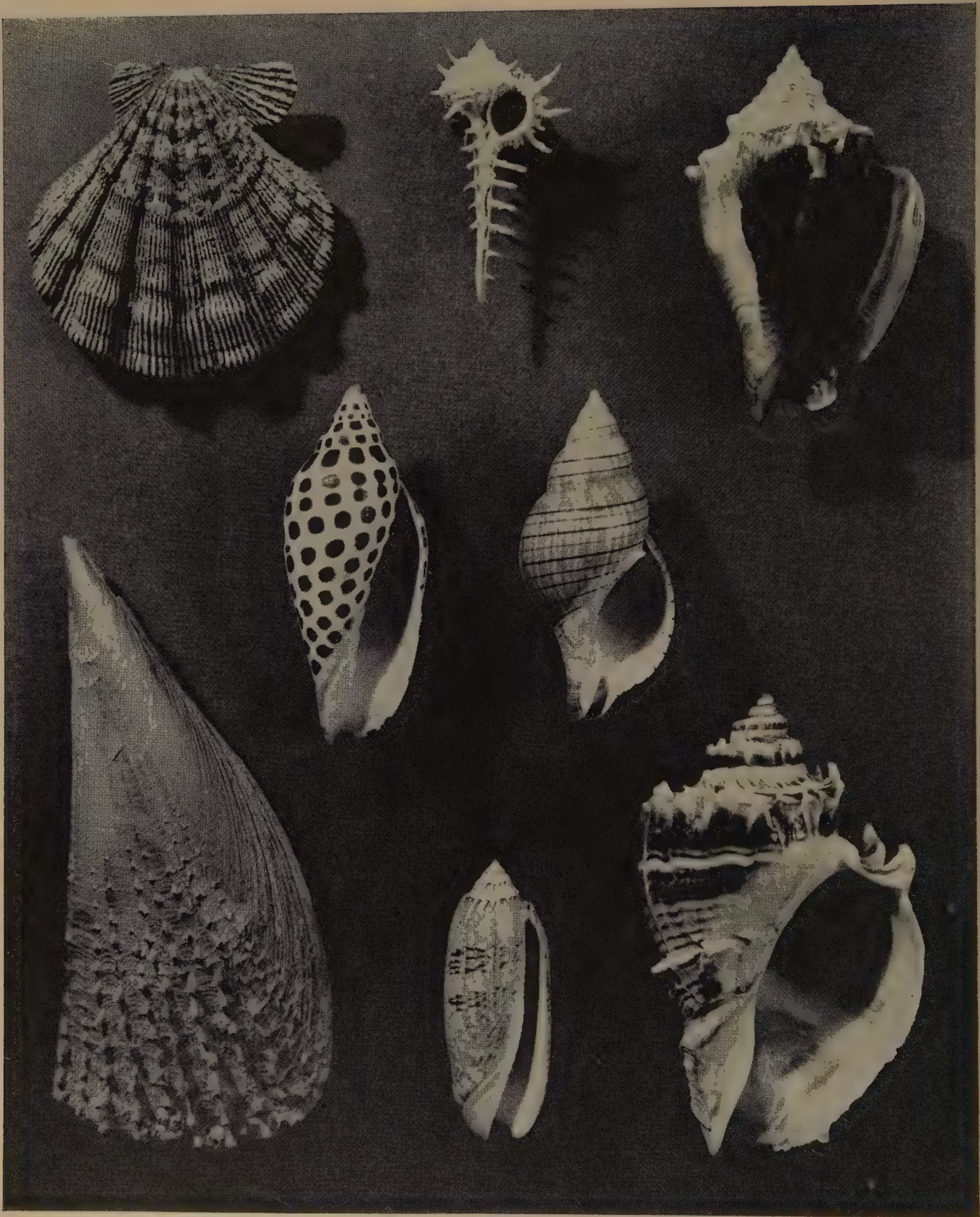


Hypothesis

By PAUL CHURCHER

Firewood's green if it's unseasoned;
Fruit, if it is immature.

Man gets green with envy. Reason?
Same as fruit and wood, I'm sure.



A group of varied shells that suggest how fascinating the hobby of shell collecting may become. The three top shells are, left to right, the lion's paw or knobbed scallop, the comb murex and the fighting conch. The middle shells are junonia and the pale tulip shell. In the bottom row are the prickly pen shell, the lettered olive and the king's crown.

*You are opening up a whole new and
fascinating world when you succumb to—*

The Spell of the Shell

By GERTRUDE M. WEBER

IT ALL seems rather juvenile, at first—grown men and women picking up and admiring shells washed in by the tide. Seeing them, you stroll along the firm, hard sand of the Florida beach, close to the water's edge, feeling a little superior. Then a particularly colorful specimen catches your eye. You slow down. An incoming wave nudges it. You stoop to pick it up, turn it over, admire its luster, its delicate form, its perfect symmetry. It is quite the most beautiful and perfect shell you have ever seen, and you keep it. You gather more, returning home with all you can carry. The spell of the shell has begun to claim you.

It makes no difference—at this stage—whether the shells are marine univalves or bivalve mollusks; whether they are whelk, murex, or limpet. You do not know the difference anyway. It is sufficient that they are beautiful, or odd. This promiscuous collecting satisfies you for a while. Then one day you are walking the beach—or wading in the water, a sign that the spell has irrevocably gotten you—when someone hails you.

"Look at this perfect prickly pen shell," he exults. "Isn't that a swell long byssus?"

You admire it, of course, privately wondering why anyone is so enthusiastic about such a hirsute old thing. Then someone brings a shell to you and asks you to identify it. You examine it and finally admit you know the names of a few shells. You secretly wish that you could have identified it. This thought sets the stage for the next step. You provide yourself with a shell book, begin to learn popular and scientific names, to classify your collection, and confer and trade with others over whom the shell has laid its spell.

If you happen to be not too far from Clearwater, Florida, you will hear of and visit Hobby House there. In this little frame structure you will find a unique collection of rare land, fresh-water and ma-

rine shells, corals, minerals, uncut gems and stones. The host and hostess are completely in the grip of the shell spell, and it was there that I first really began to understand what was happening to me, and how fascinating and absorbing the study of shells can be.

Case on case of lovely shells, artistically arranged, were on all sides. Stories, many of them seemingly fantastic, surrounded many of them. We gazed in amazement at the coloring of a pink-lipped conch, wondering how anything so delicate and lovely could form down on the sunless ocean bed. We admired the

little glass shrine where a shell some two inches long rested on a red satin square. The markings on it formed a perfect picture of a little lighted church, complete to a small cross on the steeple. We examined the lovely, lustrous abalones from the California coast. I, at least, was surprised at the chambered nautilus because I will confess that I had not known until then that the inspiration of Oliver Wendell Holmes' stirring poem was a sea shell. I had dreamed of a huge coral castle at the bottom of the sea.

This visit gave new zeal to our shell collecting, and when we moved south to a house on the shore of Lake Worth our opportunity be-

came most varied. A spit of land extended out into the lake, and all around it was brackish water. The water receded, at low tide, about fifty feet, exposing on the sand flat many crown shells, band shells, Florida bubble shells and others. Each low tide yielded a fine assortment. Our "loot" we would place on the windowsills of the garage until we could wash and polish them, and my brother and I began to find some of our shells later wandering about the garage floor. We had collected some live shells without knowing the difference.

This lent a new and fascinating aspect to our studies. Many hours were spent poking around on the little strip of land, or hovering over the side of the pier

Frigate-Bird

By FRANK CHEAVENS

Midnight at noonday,
Satin-black against blinding blue,
Circling the water,
Hunting, hunting for treasure—
Live treasure finning out of the waves,
Or burying its brightness deep in cool indigo,
Or quivering in the buccaneering beaks
Of other birds.

Frigate-bird,
Suddenly done with soaring,
Gashing the air downward
Until it moans
Under two wing-cutlasses,
And the sea quickly surrenders
Its leaping silver
To a pirate in feathers.

with a long handled rake, scooping up shells as they came in with the tide. The wreck of an old cabin cruiser, burned beyond repair, was stranded high on the sand. It was re-christened the "Nev-R-Sail," and became my private "field laboratory." It was there that I watched the antics of each new shell with its funny, homely little inmate. It was difficult, at times, to tell whether the shell contained a live mollusk, for many of these shy creatures had a way of drawing themselves out of sight when the shell was picked up and handled. I did not know, at the time, about collecting live shells and preparing them as cabinet specimens. A live shell was just something that did not fit into my scheme of shell collecting, so when I found one about which I was in doubt, I would place it on the hull of my ship. If it was there the next morning I knew it was all right to take, otherwise it would be out of my sight and safe.

Our first winter in Florida taught us how many things—strange, interesting and amusing—one can learn from Nature in a few short months when living close to and attune with her. It is no wonder that the scientist gets so much pleasure in wresting from her one of her secrets. But the joy akin to this is that felt

by us lesser mortals, the average individuals, when we discover some trivial truth for ourselves, and then find it verified by authority.

Apart from the technical or scientific side of shell study, much real enjoyment is derived from the mere collecting. Yet the pretty and interesting shells gathered are not, by far, the only treasures a shell collector brings home after a day spent prowling along the water's edge. One cannot place a value on the joy and exhilaration that comes from breathing deeply of the fresh salt air blowing in over the ocean; the charm of water ever changing its color under the brilliant sun; the beauty of fleecy white tufts of clouds sailing the sky; the rhythm of the soft beat of the waves as they lap the sand, or the thundering roar with which they may, at other times, break upon the shore; the grace of white gulls skimming low over the water; the surprise of the shadow that crosses one's path as a huge pelican sails overhead.

Memories of these peaceful, carefree days are precious. They are conjured up, relived again and again, in the handling and displaying of the shells gathered from the beach. If the shell throws its spell about you, do not resist it; you probably cannot, anyway.



Growing Yellow Ladyslippers

By EDWIN F. STEFFEK

PERHAPS the easiest of all the ladyslippers to grow in the wild garden, and one that certainly deserves a place there, is the native yellow one, *Cypripedium parviflorum*. Although some botanists divide it into a larger and a smaller species, it seems more reasonable to consider the larger merely a variety of the same plant.

In May and June its handsome golden-yellow slippers are displayed, either singly or in pairs, on stems ten to twenty-four inches high, perfuming the area with their delicious vanilla-like scent. It is found from eastern Canada west to Ontario and Minnesota and south as far as Alabama. It is also one of our most long-lived natives. One clump is known to have been in continuous existence about sixty years.

The yellow ladyslipper is a swamp dweller, for the most part, although it can also be found growing in drier woods and thickets. It seems to prefer a

circum-neutral soil, and even though the surface may be covered with acid litter a search will show the stems extending to the non-acid soil below.

The plants grow from stout rhizomes. When left undisturbed they usually subdivide every year or two, and the plants can be lifted in the fall or very early spring before growth starts. They may then be divided into as many plants as there are buds. They should be replanted immediately in a mucky, peaty soil, with the roots spread out carefully and buds or crowns one inch below the surface. The final inch should be filled in with a mulch of forest litter, which should be added to each year.

It is well to purchase plants from a reliable dealer, rather than to despoil the woods. If there are any signs of slug injury, trap these pests with pieces of orange or lemon, or scatter a little prepared slug-bait between the plants and they will be spared from such attack.



"Hot" Sulphur

By RAYMOND
TIFFT FULLER



A few miles from Avery Island's salt mine in Louisiana sulphur is forced from the depths of a lake by a process that melts it with super-heated steam and brings it up with compressed air. Poured into huge moulds, it hardens and then is dynamited. The picture shows a bit of the huge block of the mineral, 450 feet by 100 feet and 30 feet high.



THEY do some of the world's most eccentric *mining* down along the Gulf rim of Louisiana! A layman's preconceived notions about "minerals" get jolted when he wanders about that region. In the first place, "mining" is an odd and unlooked-for occupation in such an absolutely non-mountainous terrain as the flat, deep-soiled silt there, cut as it is by broad sluggish bayous, and overlaid so generously by vast marshy tracts. But miners actually mine salt, pure rock-salt, there, as well as fabulous amounts of crude "mineral" oil—which are other stories. . . .

One hot day last winter I encountered a series of surprises about sulphur; surprises to me, at least. Driving along a secondary roadway, almost on the rim of the Gulf, on some business not to be revealed until the war clouds roll by, I was suddenly quite flabbergasted by confronting a—well, a *city block* of hard glistening yellow sulphur. And city block is not hyperbole at all. Right beside the lonely dirt road, with astonishing conspicuousness it abruptly *loomed up*; and like nothing else I had ever beheld. A huge solid brick, a parallelopiped of the yellow stuff, thirty feet high, a hundred wide, and twice as long as the distance, say, from 42nd to 43rd Streets in Manhattan.

How did it get there? How can you do that with brittle, crystalline, glassy sulphur? Men had put it there, of course. They had *mined* it; yet they did not mine it exactly, either. Nevertheless, it did come out of a mine. Yes, a paradox; but also an accurate use of words.

I alighted and walked all the way around that great brick of pure sulphur, standing there, stark, inexplicable. I gazed over the wide landscape to locate some quarry, some hole-in-the-ground wherefrom this gold-colored treasure may have come. Ah, a clue! Close

along the other side of the pile ran a railway spur. At a distance out along it stood, as if deserted and forgotten beside a string of idle coal cars, a powerful steam shovel. There was no activity round about this shovel or spur, nothing stirring, no workmen. Just how did a steam shovel work on a solid, square-angled mass of this yellow concrete!

The hot, semi-tropic winter sun beat down dazzlingly on the sandy floor of the surrounding plain. The air seemed yellower sunlight from the reflection from this mineral monument towering above me.

A smallish, factory-type, white building with two smoking stacks stood in a slight hollow an eighth of a mile distant, the only notable structure in sight. So I went over. Whereupon my education began. "Where did this sulphur come from, anyway?" I asked the sweating engineer at the nondescript little plant.

He pointed offhandedly to a small pond on the other side of the works. I looked out the window. A pair of six- or eight-inch iron pipe-lines, one from this building, one from near the giant brick, came together nearby and ran parallel until they reached the water's edge. Then, out upon a kind of floating pier, they extended to the center of the small lake, joined there at a Y, and right-angled into the depths as one united, joined pipe.

"Is the sulphur taken from mineral solutions in the water?" I asked.

"Oh, no, it's down some 700 feet below that lake bed," said the man, obviously amused and hoping to prolong the mystery.

"How? How do you get down there *under* the lake? Is there a tunnel running in from the side . . ."

"Nope. Nobody gets down there. We pump it out."

"Pumping out sulphur is a new one to me," I said.

"Oh, we *melt* it first."

I did happen to know that if you heated sulphur crystals carefully and slowly in a closed vessel it would melt as ice does. I began to grasp the kind of "mining" going on here. After a little more laconic conversation with the smiling Irishman I had grasped the situation. Down there under the pond bottom *was* a mine. A dome, a blister, a lens of practically pure crystalline sulphur. Steam *and* hot water, under pressure, were forced down into the mine through some pipes sleeved inside the large descending conduit. The warmed and liquid sulphur, mixed with hot water, arose in the outer jacketing conduit and then flowed up and out, guided in the direction of the great pile. By means of a huge wooden form erected in the shape of a box serving as reservoir, the hot yellow stream was retained and held until it solidified. The excess water soon evaporated. After a few weeks of pumping into this "box" the whole city-block-sized piece was standing there a solid unit, a monolithic piece of sulphur. The forms were then removed and another box was soon in process of erection elsewhere along the spur of railroad. And so on.

Yet the rectangular mountain was hard, solid, flinty. What then? To handle it they dynamite it.

Maxon's Dahlia

By ALEXANDER F. SKUTCH

THE dahlias, so esteemed in our gardens, which under cultivation have acquired such an amazing variety of colors and forms, all spring from a few species that grow wild in Mexico and Central America. They are found in cool highland regions where oak and pine trees flourish, rather than in the warm lowlands. The wild forms have single or possibly, at times, double flowers—that is, the petal-like ray florets lie in one or two ranks—while the more familiar garden dahlias, with their great multiplication of "petals," doubtless originated under cultivation, as has happened with so many flowers.

Of all the great variety of plants of the composite family, which, at the beginning of the dry season, help make one vast flower garden of the Guatemalan highlands, one of the noblest is Maxon's dahlia, *Dahlia maxonii*. While most dahlias are low or middle-sized herbs, this is a bush with stout, erect, clustered, woody stems, which branch freely near the top and sometimes grow to a height of twenty feet. They bear wide-spreading, twice-compound leaves and broad flower-heads made up of wide, pale lavender rays, in a single rank, surrounding a yellowish disk. This giant dahlia blossoms freely in October and November, when a vigorous plant may cover itself with a profusion of its splendid, delicately tinted flower-heads. Maxon's dahlia is distributed over the highlands from about 5000 to 9000 feet above sea-level, where it grows in the moister parts of the

Section by section, it is reduced to chunks and dust, which the shovel loads into coal cars. Then off to the world goes commercial sulphur—tons and tons.

My understanding had been that most sulphur was scraped—in a true *mining* process—from the interior of volcanoes, sleeping or extinct. Also, that in a few places the yellow element was mined as is coal. But here at Jefferson Island is a process that seems a triumph of ingenuity; quantity production of striking efficiency, using the only possible way you could get the mineral out at all! This is not so utterly new to the world's science-and-industry experts, I learned, but new enough to ignoramuses like me. Borings have shown here that the whole pond bottom—some thirty acres in extent—is *underlaid with clear sulphur* of igneous origin to an undetermined depth. Occasionally they shift the borings from point to point to avoid going down to an undue depth.

Would you call that great sulphur deposit a mine? Surely, at least, it is a *mineral deposit*—like the Louisiana rock-salt mine close by; like a Pennsylvania coal mine. Would you call that liquid, bright yellow and steaming, emptying into a wooden form untouched by hands, a mining process? Well, hardly, unless Webster's is wrong, or has not quite caught up.



forest and in clearings overgrown with low bushes, especially along streams and about the shores of lakes. It is abundant about volcano-dominated Lake Atitlán, a mile above the sea. Sometimes it grows as a weed in old cornfields. The Indians often plant this dahlia beside their rude huts—a regal adornment.

*This is the thirty-third in
Nature Magazine's series of
educational inserts.*

Some Eastern Ornamental Trees

By E. LAURENCE PALMER



YELLOW WILLOW



SHAGBARK HICKORY



LOMBARDY POPLAR



BLACK BIRCH



TREMBLING ASPEN



WHITE BIRCH

So much of our literature and art, our romance, our Indian lore and Wild West thrillers, is related to what goes on in the shade of trees that we should know some of the shade-makers better. Whether we sing "In the Shade of the Old Apple Tree," "Under the Banyan Tree," or Joyce Kilmer's "Trees"; whether we recite "Under the Spreading Chestnut Tree," or "Woodman, Spare That Tree"; or whether we read of Queen Titania's experiences in "A Midsummer Night's Dream," or how "Wild Bill" somebody was hung from the highest branch of the strongest oak, or how the goldbug was dropped from a *Liriodendron tulipifera* at the start of a classic treasure hunt, we must know our trees better. Even if we are commercially minded, and are realtors interested in a development, we recognize that trees may make us a profit if properly placed. Less practical people may find even more reason for respect of trees by reading the Rubaiyat of Omar Khayyam, with its classic:

A Book of Verses Underneath the Bough,
A Jug of Wine, a Loaf of Bread—and Thou
Beside me singing in the Wilderness—
Oh, Wilderness were paradise enow!

The forester will say that trees are of primary use in the production of woody materials; the wildlife manager, that they are essential cover; the soil expert, that they give needed soil anchorage. These are, to be sure, practical factors in our modern civilization, nevertheless it seems probable that there are as many trees grown and cared for by man for the shade and beauty they produce as are grown to satisfy gluttonous pulp mills.

But why do we encourage the growing of shade trees? Is it because they produce conditions that are important from a practical viewpoint, or are we merely satisfying something esthetic that is in the make-up of all of us? And why do we use some kinds of trees more



BEECH



WHITE OAK



SCARLET OAK

than we use others? And why are some kinds useful in one place and others elsewhere? These are a few of the questions we hope to raise, and, in part, to answer here. Of course, a thing of esthetic value has a practical importance so it may be difficult to separate these two categories.

Both of the grandparental homes of my son have rows of tall evergreens on one side—monuments to the foresight of those who wished to keep their homes protected from cold winds. These windbreaks are practical, and were even more so in the days when heat circulation in a house was wholly by gravity rather than by the forced circulation possible in my home. We know that a windbreak 35 feet high slows a 30-mile-per-hour wind down to 10 miles an hour for a hundred feet on the lee side, and that the speed does not exceed 15 miles an hour in the second hundred feet. This is highly important if one wishes to keep heat from being drawn up the chimney or out through the cracks on a wintry night. From one end of the country to the other, these tree windbreaks are the sign of an early American pioneer home. In the East, they are often Norway spruce; on the West Coast, they may be Douglas fir; but in the country of the Rocky Mountain highlands, they are Lombardy poplars, or the "Mormon trees" as they are called.

But trees may also keep homes cool as well as warm. Just try your thermometer some hot day this summer and see what a difference there is in the shade of a tree and outside its influence. Feel of a wooden or of a metal roof in the shade and in direct sunlight and you will need no thermometer to tell you of the difference; or walk barefooted on a sidewalk in shade and in the sun.

The elimination of direct sunlight, even in summer, is not always desirable. In summer a well-lighted place is drier than a dark place, although it may be desirable that our home air be reasonably humid. Also the effect of direct sunlight in the elimination of certain disease organisms must not be overlooked while we praise the comfort provided by the shade of a tree. Thus our tree may not be wholly useful under all circumstances.

One of the ridiculous things that used to be done was to have Arbor Day exercises in which the whole school set out a number of trees almost any old place. Often these trees died, but many of them grew to such size that many a school lacks the light now needed. It is not enough merely to plant a tree. The tree must be the right kind, planted in the right place. It should be neither too tall nor too short, but should reach to the proper height and stop.



AMERICAN ELM



SYCAMORE



BIRD CHERRY



BLACK LOCUST



SUGAR MAPLE



HORSE CHESTNUT

Using trees to change the appearance of a building results in optical illusions. A series of tall, slender Lombardy poplars beside or behind a low, flat building may make it seem higher than it really is; bounded by apple trees it might look even lower than it is.

Where trees are planted to stimulate the sale of real estate it is often essential that they grow rapidly. In part, because of this, such trees as poplars are used. But such trees are usually short-lived, so truly old residential areas are shaded by elms, hard maples and oaks.

There are practical reasons why many poplars and elms are not so well liked for shade trees, and in some cities they are not allowed to be planted. This is because these trees, and some others, force their roots into street sewers. Once they reach a water supply in the sewer, the roots multiply so that the sewer is clogged and an expensive cleaning-out is necessary. In many cities where this menace has proved serious, these trees are removed as public menaces. Then, too, the poplars shed many of their smaller branches freely, and these may clog the surface sewers.

There are, of course, trees that seem to meet most of the standards set for an ideal street tree but nevertheless are undesirable. Ginkgoes or maiden-hair trees that are pistillate or fruit-bearing may smear the sidewalks beneath them with offensive fruits that may cause a dermatitis in some people. On the other hand, staminate poplars sprinkle the walks with their catkins that are for a while unsightly, or the pistillate trees fill the air with a loose-flying cotton that clogs window screens. Larch trees, whose fine needles are shed each year, may pollute water in cisterns, and nut trees like the walnuts may clog spouts from the eave troughs, sometimes with the help of squirrels. As a rule, the trees with compound leaves are likely to leave unsightly trash beneath them.

Many street trees are planted because of their large, attractive flowers. Among these might be listed catalpas and horse chestnuts. To some of us, they are expensive luxuries because, while no one can deny their beauty during the week or so they are in bloom, few consider them attractive at other times of the year. Catalpas particularly become offensive when they are infested with the larvae of *Ceratonia catalpae*, or when their long, slender pods continue for a time shedding their wafer-winged seeds. Besides, in much of its range, the catalpa, like the box elder, winter kills badly, and has an unhealthy appearance.

Many shade trees are planted for their attractive fruits. I have a row of mountain-ashes along one side of my home grounds. They are admired by all, including the birds that swarm all over them in the fall migration. The sidewalks beneath these picnic tables of the birds are not always attractive, but I think I shall not remove my mountain-ashes. Mulberries are sometimes grown as shade trees and to attract birds, and are best placed so that the ground beneath may be little used by man.

In selecting a shade tree, it is well to think both of the qualities of the tree and of the animals commonly associated with it. Maple trees like the sugar maples are among the most popular of shade trees of the East. However, at more or less regular intervals, we have epizootics of forest tent caterpillars that (Continued on page 88)



BASSWOOD



WHITE ASH

COMMON NAME	CRACK WILLOW	LOMBARDY POPLAR	TREMBLING ASPEN	SHAGBARK HICKORY
SCIENTIFIC NAME	<i>Salix fragilis</i>	<i>Populus nigra</i> var. <i>italica</i>	<i>Populus tremuloides</i>	<i>Carya ovata</i>
DESCRIPTION	Height: to 80 feet. Diameter of trunk: to 6 feet. Bark: gray, thick, rough. Form: tall, slender, profusely branched. Twigs: angular, red, or yellow-brown. Bud: one-scaled, 1/6 to 1/4 inch long. Leaves: alternate, smooth, both sides green, to 6 inches long, and to 2 inches wide, with 10 to 17 fine teeth to the inch on the margin.	Tree: to 150 feet high, with trunk to 6 feet or more in diameter, and with all of the branches and twigs extending almost straight up producing a tall, slender, irregularly cylindrical tree. Suckers arise in great numbers from the base. Leaves: triangular blades, shining, dark green, and with petioles flattened near the blade.	Tree: to 80 feet high, with a trunk to 20 inches through. Crown: high, narrow, round-topped. Branches: ascending, brittle. Bark: on old part, thick, black, deeply fissured; on young, yellow-green to white, with dark blotches under branches. Twigs: slender, reddish, shining, with white pith. Leaves: to 2 inches long, thin, dark above, and light beneath. Roots: shallow.	Tree: to 120 feet high, with trunk diameter to 4 feet. Bark: gray, stripping off in long, loose, irregular pieces lengthwise of trunk. Form: cylindrical. Roots: deep. Twigs: coarse, with large, loose-scaled, hairy, terminal buds. Leaves: alternate compound of 5 to 7 leaflets, of which basal pair is smallest. Leaves: to 14 inches long. Leaflets: stalkless.
RELATIONSHIPS AND RANGE	Family Salicaceae. Common where there is an abundant supply of fresh water, being introduced into America from Europe, and well established through the eastern half of the United States. There are relatively few staminate trees in America but the tree has hybridized freely with native species.	Family Salicaceae. Originated from a staminate sport of the typical <i>Populus nigra</i> on Plains of Lombardy about 1700 and has since spread widely over the world as an ornamental. So common is it in areas originally settled by the Mormons that it has been called Mormon Tree, since it is characteristic of many of their older settlements in Utah and Rocky Mountain area.	Family Salicaceae. From Newfoundland to Alaska, south to Pennsylvania, Kentucky, Mexico and California, with probably widest range of any native North American tree. Grows on variety of soils, preferably where dry, does not survive in swamps. Abundant in cut-over or burned-over areas mixed with fire cherry and fireweed.	Family Juglandaceae. On hillsides, and in mixed forests, where soil may be rocky, but is well drained. From St. Lawrence River to Florida, west to Texas and Minnesota, except along southeastern coast. Requires long, warm summer, to mature fruits and wood to bear fruits next year. At least 15 varieties are recognized.
REPRODUCTION	Stamens and pistils: on separate tree. Staminate tassels: 1 to 2 inches long. Pistillate tassels: to 3 inches long, and slender. Pollination: by wind, in April or May. Dry seed-case: 1/3 inch long, on a short stalk, matures in early summer, opens to free fluffy seed into the wind.	Known only in staminate form although black poplar from which it was developed has both staminate and pistillate flowers. It cannot therefore be reproduced by seeds but depends on suckers for spreading in limited areas and on use of cuttings for spreading elsewhere. Many trees are reported to have developed from whips.	Flowers: appear in April, with pistillate and staminate on different trees. Staminate catkins: drooping, to 2 1/2 inches long, each flower with 6 to 12 stamens. Pistillate catkins: when mature may be 4 inches long, are drooping, with few flowers. Fruit: a 2-valved, oblong cylinder, light green, drooping, bursting to free brown seeds with white, fluffy hairs.	Staminate flowers: at base of season's shoot; pistillate flowers: at tip. Pollination: by wind. Nuts: mature in fall, and are enclosed in a thick husk, which splits to free delicious, hard-shelled nuts weighing about 90 to pound, and germinate from 50 to 75%. May live to 300 years but matures much earlier.
CULTURE AND ENEMIES	About Civil War time, this tree was sold freely and abundantly to American farmers. It will develop from a stake driven into the ground or from cuttings thrust into or dropped on the ground. Wood: light in weight, and salmon red in color. Tree is attacked freely by twig-cutting, leaf-eating, and wood-boring insects, and by bracket fungi.	A rapidly growing tree. Probably true black poplar frequently hybridizes with this. Many forms with minor differences that have been developed so that trees may be found in one form or another in widely different types of climate. Some are so hardy that they can survive severe winter weather.	Wood: weighs 25 pounds to cubic foot, fine, light brown to white, diffuse porous, with fine, indistinct medullary rays, not strong or durable. Distinguished from big-toothed aspen by having sharper buds free from flour-like crust, and by lighter bark of younger branches.	Wood: exceptionally hard, weighs to 52 pounds per cubic foot, is hard, tough, 125% as strong as white oak, flexible, highly resistant to blows; one of strongest woods and one of best firewoods. Wood: ring porous, with summer wood pores, large, evenly distributed, not in groups or lines. Leaves: may bear a mildew; twigs, attacked by a witches' broom disease.
USES	Tree has been grown freely as an ornamental and as a stream anchor. Wood: used in making small boats, in making charcoal, but is not superior as a firewood or useful in heavy construction. It warps badly in curing unless great care is taken. Recorded as being eaten by cottontail rabbit.	Essentially, an ornamental tree grown as a windbreak to shelter farm buildings but also as street tree that occupies little space at base and reaches a great height. Figures prominently in concept most people have of beautiful parts of landscape of Italy and of southern coasts of Europe.	Wood: used in making packing cases, lard pails, buckets, wooden dishes, boxes. Considered weed tree, but with high demand for wood, it may find a place as a rapidly growing pulp and cheap wood producer that thrives on a variety of soils under varying conditions. Eaten by ruffed grouse, deer, beaver, mountain sheep, and domestic cattle.	Wood: used in making wheel spokes and axles, tool handles, baseball bats, baskets, golf clubs. Nuts: have commercial value as food though not so high as walnuts. Nut meats: yield excellent salad oil. Nuts: favored by squirrels. Sap: yields a sweet gum. Bark: mixed with glucose, tastes like maple sugar. Good lumber tree. Eaten by rabbits and deer.

BLACK BIRCH <i>Betula lenta</i>	WHITE BIRCH <i>Betula alba</i>	BEECH <i>Fagus grandifolia</i>	WHITE OAK <i>Quercus alba</i>	SCARLET OAK <i>Quercus coccinea</i>
Tree: to 80 feet high, trunk diameter, to 5 feet. Trunk: usually continuous, but sometimes divided at a low point. Bark: on old parts, dark, broken into large, irregular scales; on young parts, smooth, shining, close. Twigs: with numerous, short spurs, bearing crowded leaf-scars, with wintergreen flavor. Leaves: to 5 inches long, and 3 inches wide.	Tree: to 80 feet high, with a trunk diameter, to 3 feet. Bark: close, chalky white, peeling off in horizontal bands, paper-thin, with a yellow tinge, on the inner side of the peeled off band. Twigs: stoutish, except in some varieties, finally smooth, reddish brown before becoming white. Leaves: to 3 inches long, and to 2 inches wide, sharp-pointed.	Tree: to 125 feet high; trunk diameter, to 4½ feet. Bark: close, light gray, smooth, with dark mottlings, relatively thin, unfortunately commonly carved with initials. Twigs: slender, dark yellow to gray, zigzag, with spreading, slender, long pointed buds. Roots: spreading, giving rise to shoots. Leaves: to 4 inches long, leathery, long persistent.	Tree: to 75 feet tall, with trunk to 6 feet in diameter; tall, in open, 2 to 3 times as broad as tall, with gnarled branches. Roots: deep. Bark: light gray, broken into long, thin, irregular scales. Twigs: with star-shaped pith, medium thick, with a bloom first winter, then gray. Buds: to ⅛" long, dark, reddish brown, rather blunt. Leaves: to 9 by 4 inches.	Tree: of medium size, usually to 80 feet high, but sometimes to 100 feet, with to 4 foot trunk diameter, with small, spreading branches making open crown. Bark: light brown to black, with irregular ridges separated by shallow fissures. Buds: to ¼" long, red-brown and fuzzy above middle. Leaves: to 6" long and 4" wide, 7 to 9 deep lobes. Roots shallow.
Family Betulaceae. Commonly on rich, dry soil on slopes, or even on rocky mountain slopes. Good-sized trees may be seen hanging precariously to edges of cliffs. From Newfoundland to Florida, west through Ontario to Illinois, south to Tennessee. Not found in pure stands but most common in mixed stands of other broad-leaved trees.	Family Betulaceae. Rich woodlands, most commonly near waterways, often among hardwoods. From Newfoundland, to Alaska, south to Pennsylvania, Michigan, Colorado and Washington. European white birch grown as ornamental over wider range and farther south. Many varieties including cutleaf and drooping branched forms.	Family Fagaceae. Commonest on rich bottomlands or on fertile highlands. From Nova Scotia to Ontario and Wisconsin, south to Florida and Texas. Favors gravelly slopes, and fails to thrive where there is an abundance of limestone or of water that has passed over limestone. Forms relatively clear stands. Related European beech resembles it.	Family Fagaceae. In dry upland soils or at best on well-drained, deep, higher bottomlands where there is moisture. From southern Maine to Minnesota, southward to Florida and Texas sometimes forming extensive and pure forests, or mixed with other oaks, hickory, basswood, yellow poplar, red gum, black cherry, white ash and other species.	Family Fagaceae. On dry sandy soils, often in almost pure stands or mixed with oaks and hickories. From Androscoggin River valley in Maine to Georgia, west to Wisconsin and Oklahoma reaching to altitude of 5000' in southern mountains and to 2500' in Blue Ridge where it is prevailing oak. Grown as ornamental in America and in Europe.
Staminate flowers: appear with leaves in catkins that lengthen to 4 inches from winter forms ¾ inch long, catkins form in fall preceding maturity. Pistillate flowers: in erect, slender catkins, to ¾ inch long, slender, and pale green. Cone-like, erect fruit develops to 2 inches long, and persists, shedding winged fruits through winter.	Flowers: appear just before leaves. Staminate: in groups of 2 or 3 catkins, each to 4 inches long, but starting in spring at about 1 inch long. Pistillate: in clusters, to 1½ inches long, with green scales, and red tips. Fruits: like cones, hang downward, about 1½ inches long, producing small, winged nuts.	Flowers: appear about April, when leaves are about 1/3 developed. Staminate flowers: in stalked, round head, about 1 inch through; pistillate, in 2-flowered clusters, in axils of upper leaves. Trees begin bearing relatively late, sometimes not until 13 years old. Fruit: small, spiny bur, with 2 pale, tan, sweet-meated nuts, germinates fall or spring.	Staminate flowers: in catkins to 3" long, yellow. Pistillate flowers: bright red, scattered or clustered. Pollination: by wind. Fruit: an acorn, to 1 inch long, ¼ enclosed in light, chestnut-brown cup, with thick, warty scales. Acorns: ripen in October, 100-208 per pound, 25% to 90% germination; grow to 9 inches first year. Bears fruit at 20 years.	Staminate flowers: in slender catkins, to 4 inches long. Pistillate: bright red, on fuzzy ½" stems. Fruit: usually borne singly or in pairs; a nut, ½ to 1 inch long, oval or hemispherical, or globose; red brown; ½ to 1/3 enclosed in deep, bowl-like cup whose scales are shining, red brown and closely pressed at tips. Flesh of acorn: nearly white.
Wood: 47 pounds to cubic foot, diffuse porous, with indistinct rays, dark brown, heavy, strong, with thin, yellow sapwood, superior as firewood and has qualities that permit it to be used as a substitute for mahogany and cherry in making of furniture, takes good polish and holds stains well. Tree: a slow grower; attacked by many fungi.	Wood: diffuse porous, with inconspicuous medullary rays, 37 pounds to cubic foot, strong, light, hard, brown, tinged with red, with thick, light sapwood. Ornamental European white birch is victim of a beetle that bores into trunk and kills tree, so species, common early in century, has about disappeared, but is still planted.	Wood: .9 as hard, .71 as strong as white oak, but does not weather well, weighs 42 pounds to cubic foot, diffuse porous, with broad, conspicuous medullary rays, alternating with small, inconspicuous ones. Highly susceptible to leaf blight, and bark canker, and nuts are too frequently infested with insect parasites. Trees are not easily transplanted.	Wood: strong, ring porous, durable, 46.3 pounds per cubic foot, light brown, requires 4,425 pounds pressure per square inch to shear, with thin, light brown sapwood; close grained, tough, hard. Not a fast grower but may live to 600 years, less tolerant in old age. Acorns germinating in fall may freeze unless buried by squirrels.	Wood: heavy, coarse-grained, ring porous, strong, light or reddish brown, with thicker, dark colored sapwood. Although wood is one of poorer grades of oak, trees are cut and wood used mixed with other red oaks in trade, although if there is too much scarlet oak product may not bring highest prices.
Wood: makes superior fuel and furniture. Sap yields some sugar. Oil: from twigs and wood, used as wintergreen oil in medicines and soft drinks. May be valuable as oil producer. Excellent "tea" made by steeping shaved bark of twigs in hot water and sweetening. Important food of deer, moose, cottontails and grouse.	Of much economic importance for dowels and spools. Formerly main sources of bark for Indian canoes. Still used in making wood-craft novelties and rustic furniture. Should not be peeled unless tree is to be destroyed, since beauty of tree is destroyed. Wood: excellent firewood. Eaten by 12 bird species and by deer, rabbits and stock.	Wood: used commonly in furniture, in tool handles. Makes excellent fuel, and diseased trees are important source of fuel. Nuts were important and delicious food for man and hogs, and wild turkeys fattened on them. Nuts may be crushed; extracted oil useful in cooking or in food for animals. Eaten by 15 bird species, by foxes, squirrels, bears and deer.	Important wood for heavy construction, floors, furniture, cabinet work, tool handles, baskets, railway ties, fences, fuel. Seton believes that spread of this oak is largely dependent on sustained squirrel population. Acorns used as food by Indians; early settlers boiled them for food. Pilgrims used Indians' supplies. Eaten by pheasants, grouse, squirrels.	Used primarily as ornamental and shade tree since it has marvelous beauty, particularly in fall, and since it yields rather well to horticultural manipulations that modify form for many desired purposes. Is hardy and relatively free from attacks of more destructive insect pests. Eaten by jays, grouse, deer, squirrels.

COMMON NAME	AMERICAN ELM	SYCAMORE	WILD RED CHERRY	BLACK LOCUST
SCIENTIFIC NAME	<i>Ulmus americana</i>	<i>Platanus occidentalis</i>	<i>Prunus pennsylvanica</i>	<i>Robinia pseudoacacia</i>
DESCRIPTION	Tree: to 100 feet high, with trunk diameter to 6 feet. Usual form a branching vase-shape. Bark: thick, grayish, roughened and irregular, with furrows and ridges not continuous. Twigs: fine, brown, with alternate, egg-shaped, few scaled buds. Leaves: with upper surface somewhat roughened, and base, usually uneven. Roots shallow.	Tree: to 170 feet high. Trunk: to 11 feet through, with close bark that scales off in loose, uneven sheets leaving exposed a lighter bark beneath, sometimes chalky white. Twigs: slender, shiny, with dark, reddish brown buds, encircled by leaf scar and with stipule scars encircling the twigs. Leaves: with the star-shaped blades, to 7 inches across, more or less 3 to 5-lobed.	Tree: to 40 feet high, relatively open, branched. Trunk: to 20 inches in diameter. Bark: of young stems and twigs, smooth, thin, red-brown; of old trunks, to 1/2 inch thick, breaking in horizontal bands, bitter. Leaves: to 4 inches long, to 1 1/4 inches wide, with margins bearing fine, in-curving tipped teeth, often with glands at tip.	Tree: to 80 feet high, tall, cylindrical, irregularly branched. Bark: dark, reddish brown, with squarish scales. Roots: relatively shallow, tough and yellowish under bark. Twigs: slender, zigzag, with buds hidden in leaf-scars and with short, stout thorns. Leaves: alternate, compounded of 7 to 19, small, oval, even margined leaflets. Trunk: to 2 feet through.
RELATIONSHIPS AND RANGE	Family Urticaceae. Does best on rich bottom lands or where springs supply an abundance of subterranean water. From Newfoundland, west through Canada to the Rocky Mountains and south to Florida and Texas but planted widely elsewhere as a shade tree. Through the East, it is one of the most popular shade trees but is threatened by the Dutch elm disease.	Family Platanaceae. Common in range in low, damp woods and near streams but often does well along streets. Ranges from southern Maine through Ontario and Michigan to Minnesota and south to northern Florida, southwestern Texas, southeastern Nebraska and central Iowa.	Family Rosaceae. Common from Newfoundland to shores of Hudson's Bay to eastern slopes of coastal range of mountains in British Columbia, south through Iowa, Tennessee to North Carolina and somewhat farther south in Appalachian Mountains. Best in mixed forests, on moist, rich soil, appearing abundantly in burned areas. Grows even in sand. Usually short lived.	Family Leguminosae. Common on high, rocky lands from southern New York to Georgia, west to Ozarks but planted and commonly naturalized widely east of Rocky Mountains and to some extent in Great Basin. Introduced into Germany about 1601 and now one of most widely distributed of North American trees.
REPRODUCTION	Flowers appear before leaves, in slender, drooping clusters each flower with stamens and pistils. Fruits mature shortly after flowering or about as the leaves develop. Fruit: a 1/2-inch wafer, with a papery margin, notched at the apex and hairy on margin; 94,000 to the pound; 50 to 75% germination; planted to depth of 1/2 inch reaches height of 10 inches first year.	Staminate and pistillate flowers: found in different heads on the same tree, the staminate being red and the pistillate, green. Flowers: appear in April and May. Fruits: appear as spherical heads, to 2 inches in diameter hanging through winter on stringy supports. Fruits shed into wind after first winter, 225,000 to the pound, 10 to 50% germination, mature by October.	Flowers: bearing both stamens and pistils, appear when leaves are half grown, on slender inch-long stems, in groups of 4 or 5 arising from a common point. Fruit: ripens July to September, as a 1/2 inch, pale red skinned, large stoned, thin fleshed, sour cherry that seems to be favored as food by many birds with 23 species reported eating it. Seeds: 8,000 to the pound.	Flowers: white, pea-like, most fragrant, in loose, open clusters, with standard of flower large, rounded, backward turned and scarcely longer than wings and keel. Fruit: a flat, brown, dry, smooth pod, to 4 inches long and about 1/2 inch wide, containing 4 to 8 seeds each about 3/16 inch long, dark brown, and like flattened, hard peas. Seeds: have high germination percentage.
CULTURE AND ENEMIES	Wood: heavy, 40 pounds per cubic foot, strong, tough, coarse-grained, hard to split, with a tendency to bend in curing; ring porous. Bark may be used as an emergency rope and may be peeled off in strips to make shelters, or the inner bark may be boiled and stripped off to be used as chair-bottom material. Cankerworms and elm leaf beetles may be serious pests.	Wood: reddish brown, tough, hard, difficult to split, attractive because of coarse, conspicuous, medullary rays, weighs about 35 pounds to the cubic foot. Germination: poor except on moist, mineral soil in open. Seeds harvested in fall should be frozen, in dry place, planted in spring to 1/4 inch deep. May live to age of 600 years.	Wood: light, soft, light brown, with thin yellow sapwood, close-grained and uniform. Commonly appears as a shrub on poor soils or as a weed tree in a forest.	Wood: heavy, hard, strong, durable in contact with soil, close-grained, brown or light green, with pale yellow sapwood; swells and contracts little in changing its moisture content, and is used in making wooden pins or nails. Roots: hosts to nitrogen-fixing bacteria so tree enriches soil. May grow to 4 feet a year in youth. Has many insect galls, and wood-borers, also fungous diseases.
USES	Chief use is as an ornamental shade tree largely because of the graceful arching canopy formed over streets when the tops meet. Dutch elm disease should be controlled to save this tree. Wood and bark used as suggested. Buds serve as emergency food for some birds, including such game birds as the pinned grouse and ruffed grouse.	Wood: used in making butcher's blocks, crates, tool handles, furniture, interior finishing and like. Common ornamental may be a hybrid between American and European species. Quarter-sawed wood is known commercially as lacewood and since wood does not impart odor is commonly used in making boxes for holding tobacco. Eaten by deer, mallard, muskrats.	Leaves are reported to be poisonous to live stock particularly if they have been wilted. Used sometimes as a grafting stock for commercial sour cherry where poor soils are present. Among birds and mammals known to feed on it are pheasant, grouse, bobwhite, prairie chicken, chipmunk, cottontail rabbit, moose, white-tailed deer, beaver, and black bear.	Used as a soil anchor and soil enricher. Hardy street tree though it yields some trash. Flowers' fragrance popular. Grown in managed forests for posts, railroad ties and telephone pole arms because of speed of growth and durability of wood. Roots, leaves and bark: poisonous if eaten. Seeds eaten by bobwhite, deer, rabbits.

STRIPED MAPLE	SUGAR MAPLE	HORSE CHESTNUT	BASSWOOD	WHITE ASH
<i>Acer pennsylvanicum</i>	<i>Acer saccharum</i>	<i>Aesculus hippocastanum</i>	<i>Tilia americana</i>	<i>Fraxinus americana</i>
Tree: to 30 feet high, usually slender, straight and beautiful. Trunk: to 10 inches through. Bark: smooth and attractively streaked vertically with dark green and gray or white. Roots: shallow. Twigs: slender, weak, usually straight, red and green, with 2-scaled buds. Leaves: opposite, like track of goose's foot, rounded at base, finely notched along margin.	Tree: to 135 feet high, egg-shaped to cylindrical, depending on environment, with trunk to 5 feet in diameter. Bark: relatively close, but with vertical ridges, irregular in shape and depth, grayish. Roots: shallow. Twigs: russet, straight, slender, with opposite, pointed, many-scaled buds. Leaves: long stalked, thin, with blade wider than long, somewhat 5-lobed.	Tree: to 75 feet high, with trunk to 3 feet in diameter, frequently continuous to top of tree but usually branching. General shape: conical, lower branches drooping, but turning up at tips. Bark: dull brown, with irregular scale plates. Twigs: coarse, with large, brown to black, sticky buds. Leaves: opposite, palmately compound, of to 7 leaflets, to 10 inches.	Tree, to 80 feet high, with trunk to 4 feet in diameter. Crown, dense and rounded; trunk, straight and slightly tapering, with dark gray, somewhat scaly, and deeply and regularly-fissured bark. Leaves: alternate, simple, unequally heart-shaped, with incurved, marginal teeth, and texture, firm. Roots, lateral, deep, spreading, without taproot.	Height: to 120 feet. Tall, open, straight, egg-shaped, with relatively coarse branches, standing more or less horizontally. Trunk: to 6 feet in diameter. Roots: shallow. Twigs: coarse, smooth, straight, with broad, crescent leaf-scars, and bundle scars in curved line. Buds: round, brown to black. Leaves: to 12 inches long, compound, of to 9 stalked leaflets, whitish.
Family Aceraceae. Common in mixed woodland borders or near streams but always in the shade of other trees. From Nova Scotia to Minnesota and south to Georgia in country that provides typical cover for moose and deer. Not found among giant trees of other species nor in pure stands of its own kind. Largest in Great Smoky Mountains. Usually on acid soils.	Family Aceraceae. Common on rocky highlands from southern Newfoundland, west to southeastern Manitoba, south through eastern North Dakota, central Iowa to northeastern Texas and east through northern Gulf States to Piedmont in Virginia and north. Grows frequently in pure stands or mixed with beech, birch and ash. May live 300 years.	Family Sapindaceae. Originally native of Greece but planted widely and established in many places where it has been introduced as a shade and ornamental tree. Closely related to Ohio buckeye and to red horse chestnut of Pacific Northwest. There is also a dwarf shrubby form, <i>A. parviflora</i> , frequently used in formal plantings.	Family Tiliaceae. A close relative of the linden. The family has about 370 species. This species is found from New Brunswick to Manitoba and south to Georgia and eastern Texas and is usually rather abundant within its range, though it does not occur in pure stands. It favors rich woods and loamy bottomlands.	Family Oleaceae. Found on rich hillsides, in mixed forests rather than in pure stands, from Minnesota to Nova Scotia and south to Florida, eastern Texas and Kansas but planted outside normal range for one reason or another. Commonly associated with maples, oaks and birches. Does not thrive in low, wet lands on which black ash does so well.
Flowers: borne in May and June with staminate and pistillate flowers separate but on the same plant, in loose, drooping clusters. Pollination: probably by insects. Fruits: paired samaras that may remain on tree through first winter being finally broken free and carried by wind. Seedlings: develop year following the flowering. Fruit: red in July, 1/2 inch long.	Flowers: appear with leaves, small, yellow, in groups near ends of twigs, borne on slender, drooping stalks, with both stamens and pistils in same flowers, no petals. Fruits: paired, winged samaras, with 1-inch wings, about parallel to each other or only slightly spreading. Mature in fall. Seedlings develop the following spring, with 2 narrow seed-leaves showing first.	Flowers: showy white, with a red tinge, to nearly 1 inch across, in open panicles to a foot long. Petals: 5. Flowers: borne at ends of twigs causing twigs to branch the next year. Fruit: a weak, short-spined bur, green, containing one or two large, brown, big-scarred seeds having a high percentage of germination.	Stamens and pistils, in fragrant, yellowish-white flowers borne in flat, drooping clusters in June and July. Pollination by insects, particularly bees, results in woody, spherical, pea-sized fruits, attached singly or in groups, on a wing, and distributed in October or fall by the wind. Seedlings: 1 to 2 inches high first year, with two 4- to 5-lobed, palmate cotyledons.	Flowers: appear before leaves, staminate, appearing as close clusters on one tree while pistillate are in loose open clusters on another. Pollination: by wind. Fruits: winged samaras, from 3/4 to 2 inches long, with seed at one end, wing almost wholly terminal, and the seed portion almost round in cross section. Fruits: 8,000 to a pound, with 35 to 50% germination, and 1500 usable plants.
Wood: of little importance commercially and generally weak, weighing 33 pounds to the cubic foot and being soft, pale, close grained. Leaves turn to orange or scarlet in the fall. The common name goosefoot maple refers to the resemblance of the leaves to the shape of goose's foot.	Wood: heavy, hard, uniform, close-grained, light colored, easily polished, durable, with thin sapwood, sometimes with curly grain, yielding bird's eye maple. Seeds: 7,000 to the pound, with 30 to 50% germination, planted at once in fall at depth of 1/2 inch and in one year reach to 9 inches. Tree with 15 inch trunk has 1/3 A. leaf surface that needs 100 tons of water a season.	Wood: light, soft, close-grained, whitish or yellowish, not strong. Seeds: mature in October or November; must be buried and frozen before they germinate. In spring, are planted an inch deep and 5 to 8 inches apart reaching a height of to 18 inches as seedlings first year. A severe blight of leaves, and winter killing often deforms or injures trees.	Rarely attacked by fungi, although sometimes by a canker of the bark and a leaf spot; and by an insect pest, the basswood leaf-roller. Propagated by seed stratified when ripe and planted in spring. Dry seed may germinate after 2 years. Seeds: 5,000 per pound, germinate 10-15%. The tree grows better in a mixed forest than alone, and does not resist wind or ice well.	Wood: light brown, tough, strong, heavy, hard, with thick, lighter colored sapwood; used in making tool handles, oars, furniture, boats, carriages and the like. Fruits: collected in September to December are buried in sand, planted in spring at 1/2 inch depth. Seedlings reach to 9 inches in 1 year; to 6 feet, in third season. Stumps sprout to 5 feet first year.
Since it cannot survive strong light, this maple is of value as an ornamental mixed with other trees. Its beautiful bark, fruits, leaves and flowers make it popular with man. Its twigs furnish a favored browse for deer and moose and give the plant the name moosewood or moosewood maple. Trees should not be destroyed to satisfy a temporary craving.	Wood: used in furniture, flooring, interior finish, pulley blocks, broom and tool handles, and as fuel. Ashes: high in potash, used in making soap. Sap: 2 1/2% in sugar and boiled to make maple sirup and maple sugar. Average tree yields 1/2 gallon of sirup or 4 pounds of sugar, although large trees in good season may yield 15 times this amount.	Wood used by wood-turners and wood carvers because of fine, uniform quality and because it can be cut easily. Seeds appear to be edible but are bitter and are considered by some to be poisonous. A flour paste made from seeds is reported to be poisonous to insects, and alcohol has been extracted from the seeds. Greatest popularity is as a shade tree.	Inner bark yields a cordage fiber; whole bark, used by farmers for tying logs together. Inner bark and buds have some edible qualities: Wood: valuable as "whitewood," is light, soft, moderately strong, fine-grained, white, weighs 28 pounds per cubic foot. Flowers, with help of bees, yield a superior honey. Twigs, staple food of cottontail and deer.	Fine timber tree where conditions are suitable and often trunks rise straight and uniform to surprising heights. Tree is sometimes used as a shade tree but compound leaves may produce an untidy trash. Wood makes superior fuel and commercial wood. Secretes manna, mannetol or manna sugar (not a true sugar, though sweet). Eaten by deer, rabbits, stock.



LEAVES OF THE CRACK WILLOW, LOMBARDY POPLAR, TREMBLING ASPEN, SHAGBARK HICKORY, BLACK BIRCH, WHITE BIRCH, BEECH, WHITE OAK AND SCARLET OAK.

feed industriously on the leaves. When these caterpillars pupate, they may make the vicinity most unpleasant. Elms, too, may be unpopular when the canker worms or measuring worms lower themselves by means of their silk. Also they are the hosts of the elm-leaf beetle, which may infest houses in great numbers. Of course, if the Dutch elm disease continues to spread, our elms may soon be gone from our college campuses. Most of us can remember the giant chestnuts that lured us as youngsters, and which are now nothing more than den trees for squirrels. Should the elms go the way of the chestnuts we must begin to provide for substitute trees to replace them. For this reason, some landscapers are planting red oaks in preference to the elms, perhaps young trees between the existing elms, so that should these be destroyed the oaks will have made a start towards replacing them.

Among other factors to be considered in selecting shade trees is the effect they may have on other plants. When we remember that an average-sized maple may require something like a hundred tons of water each year to maintain itself, we realize that this must be a drain on lawn grass in the adjacent area during a dry summer. They may also affect the farmer's crop production.

In the older parts of the country in the East, we still find majestic rows of sugar maples. Usually, these rows are too close together for our modern concrete speedways to go between them. As a result, many of these landmarks are vanishing along our highways.

When we consider the esthetic side of shade trees we may ask why the Bible speaks of the "tree of life." Why did a tree figure so prominently in the Garden of Eden, and why did Joyce Kilmer tell us that "only God can make a tree," if there was not something fundamentally important about trees to man in general? Enos Mills must have

seen in his thousand-year pine something other than a mass of wood cut down by a lumber company. Trees—and particularly shade trees—are in a sense an integral part of the community in which they exist. They are landmarks—conservative, fundamental, constant. They represent, in a way, the stable part of a society that to some of us seems to be threatening to go completely "hay-wire." Look about your own community and see how many "elm-tree inns" and "pine lodges" and "twin pine houses" you have. I am willing to wager that some of the "pines" are spruces, but what of it? The owners of the trees in such areas recognize that they have a trade-mark value. They are distinctive like the church steeple, or the post office, or the school house, and the owners were proud to be associated with them. It is not so important to most of us whether a spruce is a Norway spruce or a red spruce. In fact, to a great many people it makes little difference whether the tree is a spruce or a pine so long as it has beauty and grandeur; so long as the wind can sing through its branches at night, or the squirrels find safety in the top in the daytime. These are the things most of us see in "a tree."

There will always be trees that have a personal or an historical significance important to many. My row of mountain-ashes came from trees planted by my grandfather more than half a century ago. I have a striped maple my wife and I collected before we decided to share our interests as man and wife. I have a vine maple brought from the Pacific Coast from near her home, and two golden shower trees we both brought from New Harmony, Indiana, from the grounds of Thomas Say, whom I admire because of his interest in insects and my wife admires because of his interest in shells. These trees on our home grounds are a sort of rosary of the happiest part of my life. They would mean nothing to anyone else, naturally, but mean a lot to me.

LEAVES OF THE AMERICAN ELM, SYCAMORE, WILD RED CHERRY, BLACK LOCUST, SUGAR MAPLE, STRIPED MAPLE, HORSE CHESTNUT, BASSWOOD AND WHITE ASH.



As We See It



“Brothers Together”

When Hitler and Mussolini came into power one of their early acts was to abolish the Boy Scouts. In their places they created their own youth groups—regimented, militarized and indoctrinated. In a few short years these boys were fashioned into fanatical Fascists and Nazis; into soldiers who have fought with a blind valor in defense of specious ideas and ideals, inculcated in youth by the diabolically clever methods of their masters. As the Nazis overwhelmed other countries, they sought there to wipe out the Boy Scouts. They failed, for the organizations went underground, to emerge again as their countries were liberated—to emerge stronger because of that which they had sustained.

Today the Nazis face defeat by armies of free men, in whose ranks and among whose officers are uncounted thousands of men who yesterday were Boy Scouts. Since 1910, twelve million American boys have been members of the Boy Scouts of America. They are better soldiers for this experience—more versatile, more self-sufficient and more ingenious. Only the other day, from a former Boy Scout now fighting with our Ninth Army in Germany, came the voluntary observation that “Scouting was the best training I ever had.” He said that he had no idea how many tricks he had learned about taking care of himself in the open. A multitude of such testimonials has come from former Scouts all over the world. They have learned how to get along with Nature; that she is a friend, not an enemy, when you know her well.

So, this year, as the Boy Scouts of America observe their 35th anniversary, starting with Boy Scout Week from February 8 to 14, they may look back on years that have made a tremendous contribution in aiding America to meet the hard test of war and sacrifice that faces it today.

But what of tomorrow? For their theme and slogan, as they start their thirty-sixth year, the Scouts have chosen—“Scouts of the World—Brothers Together.” It is a significant phrase for it carries words that represent the hope of mankind. A gallant man has left with us the thought and reality of “One World”; brotherhood was taught by the Galilean, a lesson

that man must learn if he is to survive. Thus the Boy Scouts have set a goal that should likewise be the aim of the peacemakers and the architects of the post-war world.

According to the latest figures available, the Scout membership throughout the world is three millions. Upon this firm foundation, representative of seventy-three nationalities, must be built the brotherhood of youth. Wherever a Scout may go the handclasp and sign of recognition are the same; all bear the trefoil on their badges; the Scout Oath and Law and the Scout ideals vary only in phrase; Scouting is open to every race, creed and class; Peace Day—St. George’s Day, April 23—is observed by Scouts the world over. In these bonds, which surmount the barriers of language, lie brotherhood.

We have heard and read much of the problem of reeducating the peoples of the aggressor nations. Perhaps the greatest and most important problem is the reorientation of youth in these countries. They have been brought up on a mental diet of lies and distortions of truth. They have been warped by regimentation; they have never known the meaning of true freedom of thought and action. What better means, then, to the reeducation of German youth than the restoration of the Boy Scout movement in Germany!

Elsewhere it is to be hoped that Scouting will enjoy renewed growth and vigor. It is needed in the countries subjugated by the aggressors, to the end that the youth of these nations may be strengthened physically and mentally for the solution of the problems of peace. Its record warrants an expectation of greater influence in America, both South and North. Scouts have made important contributions to the war effort—in salvage, civilian defense, bond drives, and many other ways. They can make comparably important contributions in time of peace.

So, as the Boy Scouts of the World dedicate themselves to a goal of world brotherhood of youth, we congratulate them on their accomplishments; we wish them even greater successes for the future. Those of us who are far past the Scout age should give them every possible aid.

Arcadia Sanctuary

By MARY S. SHAUB

This is another article emphasizing the importance to wildlife, and to the community, of small, inviolate havens for birds and mammals.

A view across Mill River and the swamp near the southern end of Arcadia Sanctuary. This is a favorite location for observation of wild ducks feeding in the swamp.



WITH a provision that it be "a permanent sanctuary for birds and other forms of wild life in memory of our son, Robert Searle Chafee, so that many persons, and especially those who are young, may share the happiness which always came to him in watching birds and exploring the wild places where they live," Arcadia Sanctuary was given to the care of the Massachusetts Audubon Society. It is now welcoming those who find happiness in Nature.

Robert Searle Chafee passed away in 1941 at the age of twenty-six. His father and mother, Mr. and Mrs. Zechariah Chafee, Jr., acting on behalf of themselves, Miss Ellen Sharpe and Mrs. Jesse H. Metcalf, made the memorial gift. It is not, however, a new and undeveloped haven, for its former owner, LeRoy S. Combs, had maintained the property as a sanctuary for forty years.

The sanctuary is ideally located on the southern edge of Northampton, Massachusetts, at the convergence of the Connecticut River Valley and the north-south valley between Northampton and New Haven,

which provided the route for the old canal that connected New Haven and Northampton. Arcadia consists of woodland, marsh and meadow, and includes a house and barns in good repair. The woodlands are located on an old river terrace formed by the Connecticut River, and consist of birch, oak, hickory and other deciduous trees. There are several large areas of fine laurel, and a good stand of pines at the attractive picnic ground. From his own nursery, Mr. Combs had planted hundreds of conifers, which eventually will add greatly to the value of the uplands in attracting still more land birds. A stroll along the upland paths, where abound many ferns and wild flowers, rewards one with glimpses of many species of birds, and, at times, other wildlife, including squirrels and rabbits.

One of the most important parts of the sanctuary is the marsh, known locally and described on the topographic maps as Danks Swamp, which occupies an outer and ancient oxbow of the Connecticut River. Mill River formerly flowed through this marsh. The river was diverted to drain directly into the Connec-



In winter a sheltered feeding station near the headquarters house attracts many winter feeders to the provender set out for them. In summer many nesting boxes are provided for visitors, such as the tree swallows at the right who are looking over a home before moving in to raise a family.



View looking south through the Connecticut River notch in the Holyoke Range. The stream in the foreground is the recently diverted Mill River, which meanders through the swamp, a favorite area for waterfowl. Tree swallows are among the most numerous of the birds at Arcadia Sanctuary, and, below, a pair makes advantage of one of the many nesting boxes that have been placed in hospitality to bird visitors.

icut, and, a few years ago, was rediverted so that it once again flows partly in its original course through the swamp.

Following the first diversion of Mill River, Danks Swamp was planted extensively to wild rice, which during late summer attracts a host of birds—marsh wrens, egrets, soras and blackbirds, and in the fall many ducks and other waterfowl. Late on an autumn afternoon one can stand on the upper bridge and watch the flocks of mallards, pintails, black and wood ducks fly across the marsh against the blazing sky, then land within easy binocular observation in

the open water areas of the marsh. The present course of Mill River is an advantage in some ways in that the constant current tends to keep the swamp water fresh. Mr. Combs formerly had a fine observation tower here, but the hurricane of 1938 destroyed it. It is probable that in the future a new tower may be constructed, which will facilitate observation of aquatic birds.

The nesting season of the bobolinks and swallows is one of the most interesting times for prolonged visits at Arcadia. The meadows and fields are favorite spots for the bobolinks, and one may frequently see

them flying back and forth singing joyously their distinctive bubbling melody. Under the barn eaves there are numerous nests of cliff or eaves swallows, several pairs of barn swallows plaster their mud nests on the barn rafters, and the nesting boxes located on poles around the grounds are filled with glistening tree swallows and blue birds. At times purple martins make a brief visit in the spring, and, with proper inducement, may regularly become summer residents. A number of boxes are occupied each season by wood ducks, the most beautiful of all American ducks. The wood duck has the peculiar habit of nesting in hollow trees, and,



at times, the nest is a considerable distance from ponds or streams. With this nucleus of wood ducks nesting at Arcadia it is not improbable that with their steadily increasing numbers many pairs will seek nesting sites in surrounding areas.

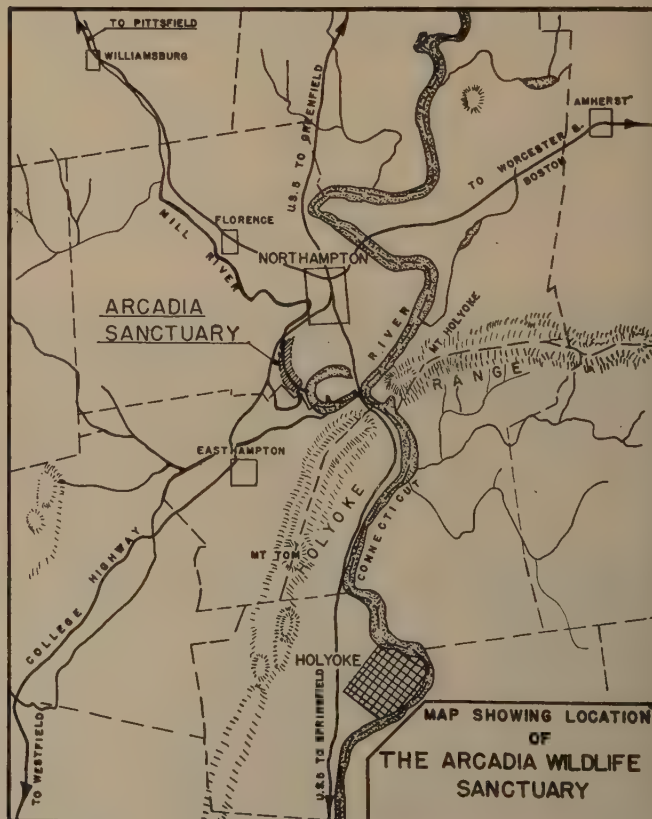
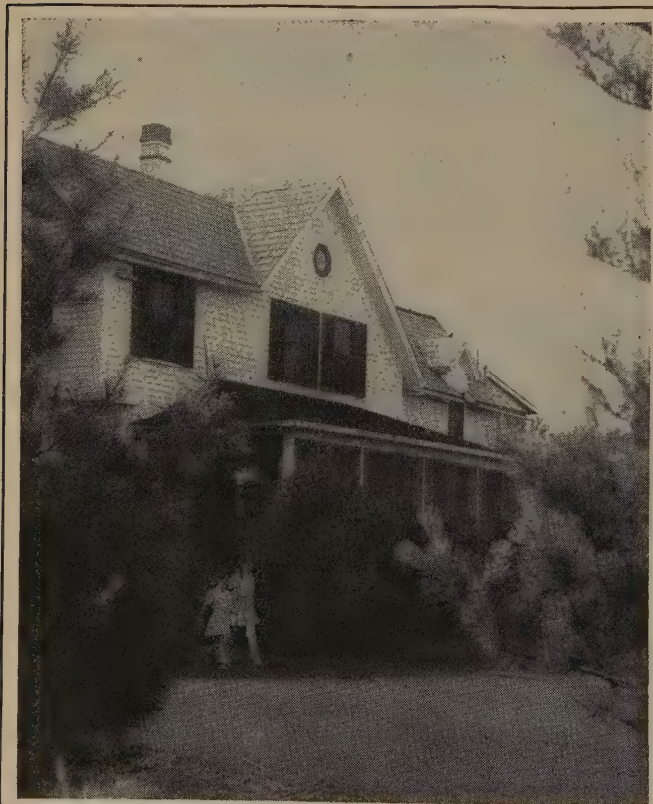
The possibilities of the sanctuary are innumerable. It has a superb location, both in regard to visiting migrants and proximity to the route of the annual hawk flights over the Mt. Tom Range, which stands at the apex of the converging valleys. Arcadia provides adequate nesting sites for a great variety of water and marsh birds. In addition, numerous land and water animals find a suitable habitat here. The marsh area offers a fine opportunity for the study of aquatic and amphibian life. With continued and more extensive planting of wild rice and cattails to



Robert Searle Chafee, to whose memory Arcadia Sanctuary is dedicated. A lover of wild-life, he drew happiness from Nature and the haven will enable others similarly to enjoy it. Below is the home of Mr. and Mrs. LeRoy S. Combs, which will now serve as the headquarters building for the sanctuary. The headquarters is supplied with many nesting boxes.

attract more ducks and other marsh-dwellers, and with further planting of berry-bearing shrubs and trees to encourage more land birds, the number of species identified here in the future will probably exceed the present count of about two hundred.

Banding undoubtedly will be carried on to a great extent, as the new superintendent, Mr. Edwin A. Mason, was formerly associated with the Wharton Bird Banding Station in Groton, Massachusetts. With many educational institutions in the Valley, Massachusetts State College and Amherst College in Amherst, Mt. Holyoke College in South Hadley, Smith College in Northampton, Deerfield Academy in Deerfield and Wiliston Academy in Easthampton, eager students can easily be found to assist in the banding and in all phases of the work.



*The only American to hold
the title of Professor of
Ornithology is Cornell's—*

Arthur A. Allen, Ambassador of the Birds

By PAUL CHURCHER

Arthur A. Allen today. Across his desk pass injured and orphaned birds of his region, and over his telephone come bird queries from Ithaca and vicinity.



WHERE the trail broke free of the woods at the hill's summit, the ornithology class straggled up to an appreciative halt. In front of them the valley fell away, field and meadow, stream and marsh, sprawled in interminable pattern in the late spring sunlight. For a few seconds interest darted here and there in visual forays, then gathered, centered, waited upon the man in charge.

Quite casually he said, "I believe there's a hawk in that dead tree by the creek."

Since the tree was some distance away and partly hidden by its neighbors, this observation seemed open to some doubt. Such was immediately expressed, growing stronger when those equipped with field glasses had scanned and scrutinized it to no avail.



"Huh!" scoffed one outspoken skeptic, "I know you've got good eyesight, but if you can see that far, I'm a home-ec major. You'd need eyes like Superman."

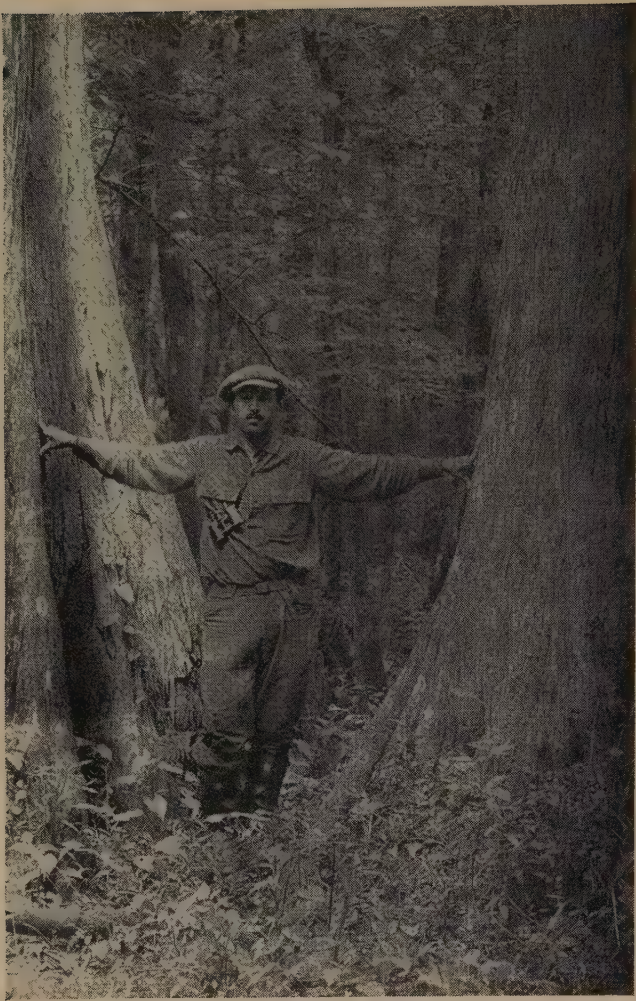
The professor's features struggled to register a hurt expression, but the twinkle in his glance was too great a handicap.

"All right," he offered. "We'll hike down that way. I'd like a closer look myself. From here I can't tell whether it's a red-tail or a red-shoulder."

Forty-five minutes later, an amazed ornithology class watched a red-tailed hawk spring from the "dead tree by the creek" and fly off up the valley.

Arthur A. Allen did not need to have eyes like Superman, for he knew, beforehand, that year after year, for certain hours of the day in this particular season, a red-tailed hawk favored the tree in question. Nor is his familiarity limited to hawks. As Professor of Ornithology at Cornell University since 1925 (the only man to hold such title in this country), he has come to know the habits of the birds of Ithaca and vicinity so well that, blindfolded, he could call the roll in regard to the

Breakfast on bird census day flows out to a stone table in the yard. Something has distracted part of the group — perhaps a northern water thrush, since one haunts this spot each spring.



A younger Arthur Allen in the field. This hitherto unpublished photograph by Mrs. Allen shows the ornithologist in a Paul Bunyanesque pose, pushing the trees apart as he surveys the Nature scene.

whereabouts of most of them on any designated occasion.

Birds are his life, vocation and avocation. Since he took his Ph.D. in 1911, his waking moments have been spent hot upon their trail, up and down the length of the Western Hemisphere. If he has dreams, surely these, too, are of warblers, of vireos, of gulls and terns, of eagles.

Arthur Augustus Allen was born in Buffalo, N. Y., December 28, 1885. His interest in birds goes back into childhood years farther than he can remember. His first bird club was composed of his own family, two brothers and three sisters. It imposed inflexible rules in authenticating observations and regulating collections. As a reference library, it had the one-volume Samuel's *Birds of New England*. This book contained no key. Consequently, when an unusual specimen was encountered, it was necessary to make a guess where to begin and read through until the description fitted. When an identification could not be made, the club chose a name of its own until correction could be made. In this manner, the first catbird was "the red-under-the-tail bird"; a chestnut-

sided warbler became "the well-varnished bird," and so on.

Arthur Allen came to Cornell on a state scholarship, intending to study forestry. The year he arrived, 1904, the Forestry College closed. Turning to zoology, he became, in his own words, "a half instructor" in his sophomore year. By his junior year this had grown to a formal, full instructorship. He had earned his A.B. by 1907, his M.A. by 1908. In his spare moments he rowed on the University crew, and joined Sigma Xi, Gamma Alpha.

On August 17, 1913, he married Elsa Guerdrum. She holds a Ph.D. in Mammalogy, and readily steps into the Doctor's place when he is absent.

In 1912 he made his first expedition, to South America for The American Museum of Natural History. In the years following, there have been few that failed to find him far afield, lugging notebook, camera, and recording equipment. Last summer he roamed the shores of Hudson Bay. He is back now, but only in passing. By the time this goes into print, he will be returning from the impenetrable jungles of Central America, after research for the Army.

With all his wandering, exploring inclinations, Allen might be expected to have some difficulty in settling down long in one place, or to one problem. Hardly! Consider the task of raising ruffed grouse in captivity. It seemed as though everyone who could differentiate between a sandpiper and a meadow lark had attempted to perform it. They all agreed it could not be done. Most embarrassingly, Allen proceeded to do it. For that feat he received the 1924 Outdoor Life Medal.

In Allen's primary job, teaching, he is the man who built a better mousetrap. Undergraduates wander into his prerequisite course, bent on no more than picking up a few hours' credit, and they transfer to ornithology; graduate students wear a beaten path to his office from the four corners of the earth. I, myself, knew one middle-westerner into whose perceptions birds had never made their way. One night, by chance, he was present at a dinner at which Allen spoke. A month later he was enroute East, anticipatingly impatient with the mile-a-minute speed of the train bearing him. And today, as members of our Armed Forces, many such students are using the mastery of plant and animal life fostered by bird study to make safer and more endurable existence under primitive conditions.

As a lecturer, Allen is rather hard to rate. By no appraisal is he an orator. So imperturbably British is his manner, so uniformly does he appear to be in a state of never being excited, you wonder how under the sun he can arouse enthusiasm. Soon, from the heights of your own enthusiasm, you know. To Allen, the discovery of his ten thousandth bird's nest is as thrilling as was the first. What you first judged to be detachment is really the hushed whisper of excitement; he is drawing the curtain from a new world of

melody and beauty and enchantment. Each listener feels that to him alone are directed the vivid, warm, secret-sharing revelations.

If proof is need of the Professor's motive and holding power, it is evident in the Ornithology Laboratory. The place is never empty. Lunches are eaten there, sleeping bags have a habit of being unrolled on the floor, and, in warm weather, any member too weary to face the long walk to his lodgings goes up and sleeps on the building's roof under the stars, content with being on hand to get an early start in the morning.

Naturally, classes spend as much time as possible in the field. Much of this consists of early morning walks. They are given seven mornings a week. The Saturday one is especially for the townspeople, but they are welcomed the other six. For a student, the usual requirement is any one morning. There probably have been no more than ten students in the last ten years who went out only once a week.

The first walk has a bit of an impact on the uninitiated. He gropes his way out to the meeting place while it is still dark, half awake, half dressed, half breakfasted, and three quarters frozen. He shivers. He rubs his eyes. Wet grass slaps against his legs and gray mist swirls about him. The sunrise seems a half-forgotten promise. He stumbles over logs and bumps into branches. He curses the folly that has led him into such a situation. Then, in the midst of his most violent self-pity, a miracle occurs. The muffled thunder of a ruffed grouse drumming rolls down a hemlock-shadowed aisle. A redwing whistles from a willow-bordered clearing. There is a sudden flurry in a tree top, a flash of color, a glimpse of black and orange on a swaying branch, the clearness of an oriole's morning song. The complainer stops to listen and is lost. He will be stopping and listening ever after, and he will find no greater satisfaction.

One of the favorite walks is to the Fuertes Sanctuary at the head of Cayuga Lake, a spot which Allen conceived, sponsored, and brought to realization. Every shore bird and water fowl common to the northeastern states comes there in security. Another



The duck hawk of Taughannock. Dr. Allen wanted a perfect picture of a peregrine posing against the white-plumed falls. He got it.

is along Fall Creek and across the fields to Sapsucker Woods and the chickadees of Lane's Farm. This trip is well thought of by the chickadees, also. They descend in flocks to hands, arms, and heads, each one eagerly awaiting the chance to scramble to an out-thrust chin and tug at a peanut held between the lips.

The big events of the year are the semi-annual censuses. Fifteen thousand individuals and more than 170 species have been recorded on a single one of

these during the height of the May migration. Well before dawn, small groups go off to designated stations, to be ready when the first light filters from the sky. Later, when the sun is gold and the world is warm again, they meet at Allen's home. Observations are checked against a master list, while breakfast flows out of the kitchen and to a huge stone table in the glen that skirts the garden. Then the real work begins. Cars are scraped together and the rounds of all the likely spots of the Cayuga Lake Basin are made. Only when twilight gleams in the waters and stains the darkening sky do they return. Incidentally, the only criticism I have ever heard offered of the Ornithology Department was by the driver of a car following one of these groups. An elderly gentleman, he murmured resignedly, "When they get their eyes on a bird, I'll be darned if I can tell who's doing the driving."

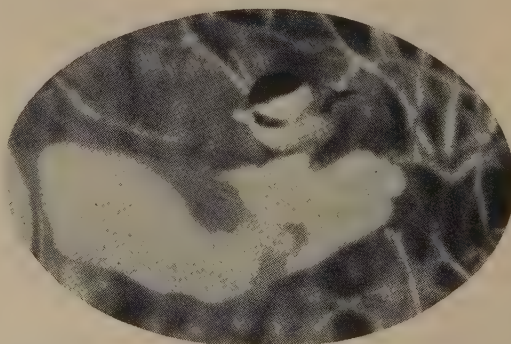
Esthetically and scientifically, not the least of the Doctor's contributions are his photographs. Whenever a series of them appears, even the most acid, bird-shooing, cat-surrounded spinster leaves off in the gloomy contemplation of her cluttered domicile and looks in breath-taking admiration. Behind these pictures are all the lengths of patience and preparation necessary to perfection. For example, there was the case of the Duck Hawks of Taughannock. One spring a pair of peregrine falcons built their nest there, high on the south wall of the lower gorge. Wild, fierce, suspicious, any decent photograph of them should have been satisfactory—that is, to anyone but Allen. He wanted more than that. He wanted one in which the tall, white-plumed goddess of the silver falls became the background. He studied all of the birds' chosen perches. One by one each eliminated itself as unsuitable. Finally there were none left. Did he give up? Did he assume a lesser goal? He never so much as considered



They said it could not be done, and many had tried it, but Arthur Allen became the first to raise ruffed grouse in captivity. For this he received the Outdoor Life Medal in 1924. Here he visits with some of the birds.

a mecca to every human and feathered migrant drifting by.

Any first visit is a trifle disconcerting. The winged members of the family see to that. A burrowing owl may amuse himself with swoops through the living room; a brown thrasher may wander in and begin a preoccupied pecking of the nearest ankle; a magpie may sidle cautiously up to you, then suddenly make off in throaty triumph with any article on which you have relaxed your grip. In the yard outside, two barred owls sit in solemn contemplation within their



With an air of "It's about time you got here," a chickadee of Sapsucker Woods exacts his toll of peanuts.

it. With a dead sapling in his grasp, and a single length of rope between himself and eternity, he descended to the edge of the three-hundred-foot cliff, and fastened the weathered wood to the sheer rock above the nest. Little by little, the hawks grew accustomed to it. Finally, as he had hoped, they accepted it as a perch. Now Allen lowered himself at another point and fashioned a precarious blind. When that, too, had been accepted, he calmly took his picture. Those who have seen the result know whether the effort was wasted.

I mentioned the Allen home some lines back. It deserves more pointed comment. It is unique. Actually, one almost has to see it to believe it. A sprawling, rambling house, set in five acres of lawn and ravine and woodlot, it is slightly more than the dwelling place of the Dr. and Mrs. Allen, their two sons, three daughters, and a few-odd grandchildren. It is

next to them a young great-horned owl stirs uneasily and snaps his beak in warning. The latest acquisition, a foundling dropped on the doorstep and now grown to maturity, is Jimmy, a crow. When old enough to make a tour of inspection, Jimmy set up bachelor quarters on the front porch roof. Soon he discovered this to be a perfect launching site for un-Pallas-like sallies at the heads of the

(Continued on page 108)

Natural History of an Arsenal

By MAJOR ROGER BARTON

Sally Wardner feeds a fawn waif at Picatinny Arsenal, and, below, some of the many deer on the acreage of the reservation. They are untroubled by what goes on around them.



PROBABLY there are few places in the country that combine such a concentration of wild animal life with such great human activity in the manufacture of instruments of death as does the Ordnance Department's Picatinny Arsenal at Dover, New Jersey.

There, during this war, some 18,000 men and women have worked three shifts a day, manufacturing smokeless powder and high explosives, and loading them into shells and bombs. Yet, the reservation remains a veritable wildlife preserve for mammals, birds, fishes, and reptiles, which, on the whole, seem little disturbed by the activity around them.

I have seen deer continue to nibble grass on the testing range while 37-mm. tractor rounds were fired over their heads. I have caught eighteen-inch brook trout from a stream that flows by only a dozen feet from a row of powder magazines, and have watched a pileated woodpecker hack away at a tree stump unconcernedly while ammunition trucks and jeeps whizzed by within a stone's throw of his perch.

Picatinny Arsenal's 5000 acres lie some thirty-five miles northwest of New York City, as the crow or bomber flies. The reservation is in the foothills of the Kittatinnies, and is situated in a valley whose western

edge is Green Pond Mountain. In the valley are Lake Denmark and Picatinny Lake, the former draining into the latter, and the latter emptying into Green Pond Brook. These waters flow eventually into Jersey City's reservoir. The area is interesting to the geologist, because it contains a characteristic quartz conglomerate known as the Green Pond formation. But to the naturalist there is even greater interest, because the varied terrain, consisting of high wooded ridges, dry meadows, deep woods, and marshes, along with lakes and streams, harbors a rich variety of wildlife.

Abundance of animal life at the Arsenal is promoted by a number of artificial factors. Obviously, no hunting can be allowed in an area where explosives are manufactured and stored. The only fishermen allowed on the reservation are civilian workers who have served the Arsenal fifteen years or more, and military personnel. Trees are cherished, because they break the force of great explosions if such ever occur. No tree can be felled without special permission of the commanding officer. Since the reservation is enclosed for the most part with an eight-foot hurricane fence, animals that are within the enclosure stay



there, safe from the gunner, both within and without.

Among the quadrupeds, deer are most remarkable. A recent census at the adjoining Lake Denmark Naval Ammunition Depot revealed about one deer to every three acres. The proportion is not so high at the Arsenal, but the animals are numerous and tame. It is common to pass a small herd grazing beside the road, and, day or night, they will tolerate an automobile within a few paces. Workers have made salt licks near their manufacturing buildings, and almost a score of deer have been attracted to one of these licks in one day.

Woodchucks are especially numerous, and in a drive about the Arsenal at twilight I have startled a dozen in half an hour. Employees in the explosives buildings of the "back line" that stretches along the base of Green Pond Mountain report occasionally from the night shift that they have seen a bobcat on the mountainside, but only one has actually been killed within the past six years. Beavers occasionally dam Green Pond Brook, creating a special job for the Maintenance Department, although most of these animals have recently been taken by the State game warden to other localities in southern New Jersey. One night powder workers saw a gray fox and her young walk by one of their buildings. Skunks, minks, weasels, opossums, muskrats, red and gray squirrels, are other members of our interesting animal community.

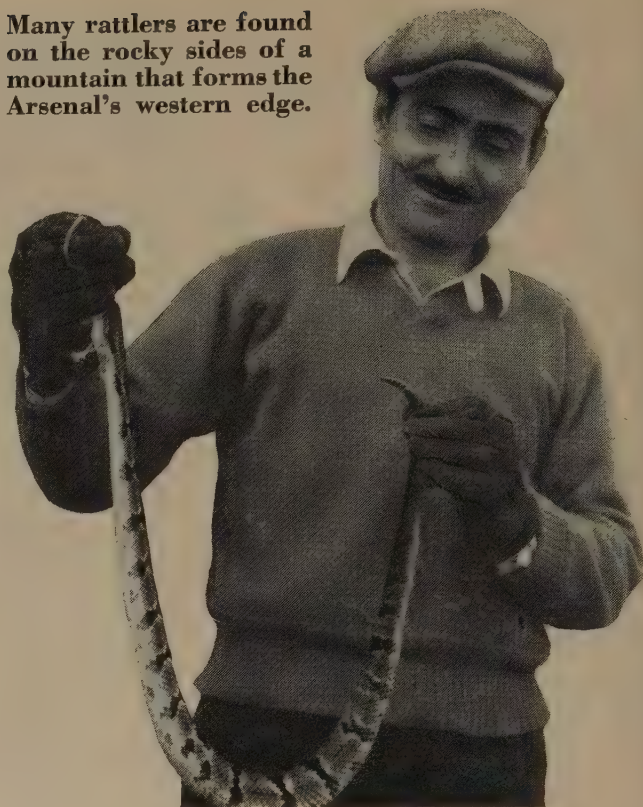
Green Pond Mountain, against whose stony ribs anti-tank and field pieces fire experimental rounds, is a haven for rattlesnakes. This ridge, with its huge boulders and impassable precipices, is rarely visited by pedestrians, so the reptiles thrive in their solitude. Copperheads are frequently killed by the Arsenal's guard force in their nocturnal rounds. The dogs used by the guards for night patrolling of lonely areas have occasionally killed poisonous snakes or have been bitten by them, protecting their human companions in either case.

Both Picatinny Lake and Lake Denmark provide excellent sport for the angler. Large-mouth black bass up to seven pounds are taken, and calico bass are abundant. Pickerel, yellow perch, bluegills, sunfish, and catfish reward even the casual fisherman. The streams connecting the lakes provide brook and brown trout, and an occasional sucker or other species may be seen.

The Arsenal is fond of its mallards. A flock of about fifty resides permanently on the reservation, and wanders at will about the quarters and other buildings, and the birds grow fat on bread and corn tossed by Arsenal workers. In the spring of 1935 six eggs were hatched, and the young mallards were fed so well that they remained the following winter. The flock has increased since, and has been added to by the fish and game commission.

The pileated woodpecker has been observed for the past two years in the northern, heavily-wooded

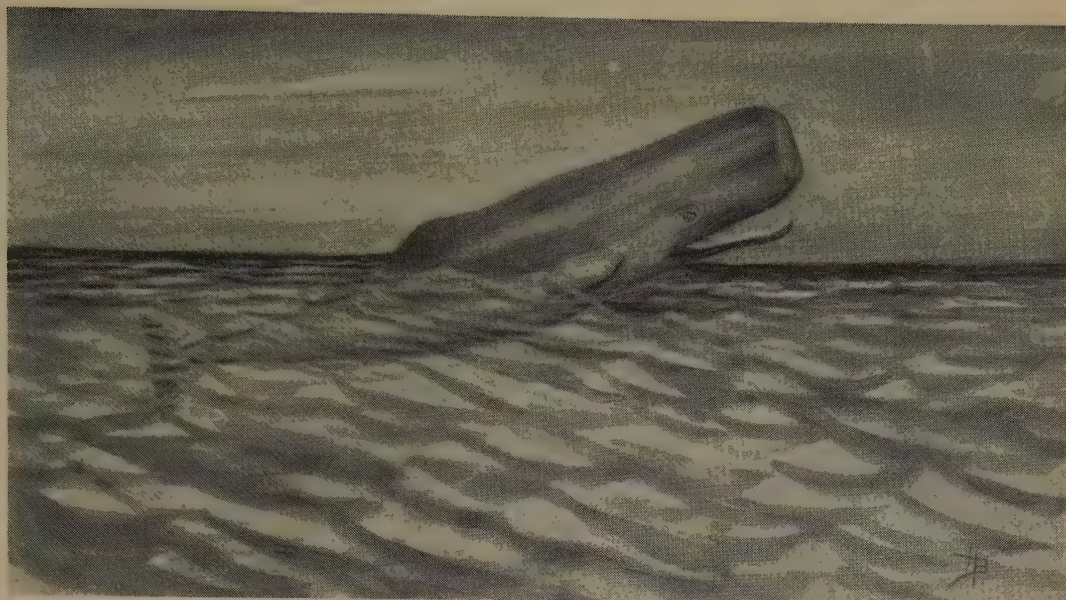
Many rattlers are found on the rocky sides of a mountain that forms the Arsenal's western edge.



section of the reservation, and ventures occasionally into the manufacturing and quarters areas. On the shore of Picatinny Lake near the powder factory, where the air is sweet with the smell of ether used in manufacture of smokeless powder, one can invariably find the great blue heron. The marshes north of Lake Denmark invite the little blue member of the tribe. The lakes also attract the osprey and herring gull. Although the cardinal does not appear to have adopted Picatinny Arsenal as his home, the rose-breasted grosbeak is unusually common and tame. Warblers do not appear so plentiful in migration as they do a score of miles farther south in the state, but this observation may be based upon inadequate field work. Winter walks are made interesting by an occasional red-breasted nuthatch, pine siskin, Acadian chickadee, or evening grosbeak. As I lie abed at night I hear the killdeer cry as they wheel about nervously in the sharp autumn air. It is a reminder that winter walks will follow.

A mere catalog of the birds on the reservation would be tedious. They include the birds of the marshes, the dry uplands, the rocky ridges, the deep woods, and the shady lawns. For years I have been familiar with the rich bird life of Troy Meadows, which—at Parsippany-Troy Hills—is only a dozen miles from the Arsenal, and I know its excellent reputation among ornithologists. But I am sure that a day at Picatinny would produce as many marks on an A.O.U. check list as a day at Troy Meadows. Sometime when the war is over, I hope to join with other bird lovers and make a list of the arsenal birds.

The sperm whale has a tremendous mouth, capable of swallowing seals, sharks or a man. If it gets its temper up it can bite a whaling boat in half.



Some Whale Facts

By HARRY B. BRADFORD

Illustrated by the Author

IN THE New National Museum at Washington, D. C., there is a painted model of a sulphurbottom whale, the original of which was taken off Newfoundland in 1903. The blue whale was given the name sulphurbottom by north Atlantic whalers, who noticed the yellowish coloring along the under side, caused by a film of diatoms that had formed there.

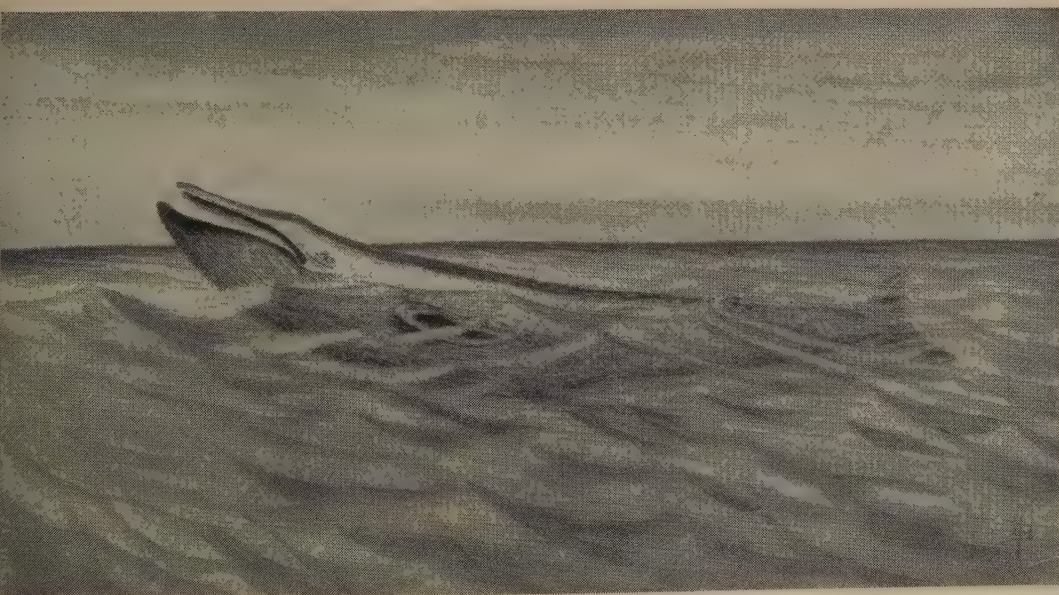
This model is seventy-eight feet in length, thirty-five feet around the shoulders, and has a head length of nineteen feet. The flukes are sixteen feet across, and the flippers are about eight feet long. The weight of the original animal was sixty-three tons. The bones weighed eight tons, the blubber eight tons, the flesh forty tons, and the blood, viscera and whale-

bone, or baleen, seven tons—all in all, some whale!

The skull of this whale weighs three tons; the upper part two tons, and the lower jaw bones one ton. This skull is nineteen and one-half feet in length. The lower jaw bones are separated at the front and attached in life only by cartilage. They are curved like the gunwales of a stubby rowboat, and could easily seat ten men, if they were a boat instead of jaw bones. Dr. Remington Kellogg says that the Museum is preparing the lower jaw bones of one of these animals weighing two tons!

This means that each of these jaw bones weighs a ton—a hefty mouth frame to carry about!

According to Dr. Kellogg these whales reach a length of one hundred feet. One, eighty-nine feet



The blue whale has a mouth arrangement quite different from that of the sperm whale. Opening its mouth, it rushes into a mass of shrimp, straining them into its stomach.

long with a circumference of forty-five feet, weighed one hundred nineteen tons and yielded one hundred sixty-six barrels of oil. Six barrels of shrimp were found in the stomach of one of these monsters.

The blue whales are found near polar pack ice of both hemispheres. Some pictures show whales spouting water from their "blow hole," or nostril. This spouting is not water but their breath, which turns to vapor as it reaches the icy air. As whales are mammals they must breathe air, so they can not stay submerged for any great length of time, but must come to the surface to breathe. The sperm whale can go down three thousand feet or more, but must come up within fifteen minutes to get a fresh supply of air.

Whales may be divided into two main classes—toothed whales and toothless or baleen whales. This baleen consists of long strips of tough, flexible material that hangs from the sides of the roof of the mouth. The blue whale is provided with this baleen, but the sperm whale has a set of conical teeth, in the lower jaw only.

The accompanying drawings show what a great difference there is in the mouth forms of these two creatures. The blue whale has a throat of only a few inches for its opening, while the sperm whale could swallow seals, sharks, or a man.

Dr. Kellogg says that a man swallowed by the sperm whale—even if he were not bitten in two—could not last long in the powerful gastric juice. In feeding, the blue whale turns on its side, with mouth wide open, and rushes into a mass of shrimp near the water's surface. He makes a great haul of these crustacea, then turns back-up again, and, with his huge tongue, presses the mass of shrimp against the roof of this mouth. As the water he gulped in rushes out through the baleen curtain, the shrimp make a rapid trip into the interior.

The male sperm whale reaches a length of sixty-five



Drawing of the upper and lower jaw bones of the blue whale. The lower bones are curved like the gunwales of a stubby rowboat and, in size, would be large enough to seat ten men.

feet, and, when angry, it is a dangerous fellow, and has been known to bite a whaling boat in half, or sink a whaling ship! Dr. Hugh M. Smith of the U. S. Fish Commission, writes: "Probably some vessels which have disappeared at sea were wrecked by these leviathans." In 1820 the American ship *Essex* was rammed twice by a sperm whale, and sank in ten minutes. Such ships, of course, were old-time wooden ships.

The young whales are born alive. The "calves" of the humpback whale measure from fifteen to sixteen feet, and weigh more than three thousand pounds at birth. They are nursed for about a year. The length of old adults of this species is about forty-eight feet.

In nursing their young, the mother whale turns on her side while afloat, so the baby may suck the milk without getting it too much diluted with sea water.

The sperm and right whales are the only ones that will float when dead; air must be pumped into the others to keep them afloat after they have been killed by the harpoon.

If whales have much sense of feeling, considerable suffering must have been experienced by them in the olden days when barbed harpoons were thrown, or shot, into their bodies; and they tugged a boat full of men with the barbed harpoon tearing at their vital organs. Such suffering has been greatly reduced since 1867, when an explosive bullet was invented which was shot into the whale with the harpoon. This device quickly ends the life of the creature.

After whales are captured, and have died, they are towed to the "mother ship," where they are drawn up on a ramp, and their thick blubber is cut up into strips and the oil rendered out of it on the ship.

So we find that whales furnish several thousand gallons of oil, as well as tons of baleen, bones, and internal viscera that is used as fertilizer. The sperm whale requires a ton of food a day to nourish his great body. He may live only twenty-five years or so.



An Olive-Sided Fly Catcher

By ETHEL ROMIG FULLER

Do I air my troubles, this morning, I hear
An echoing wail, DEAR ME! OH, DEAR!

But let the beads of my blessings be told—
Some, shining-new; some, precious-old—

Out in the sunny garden I see
A gray-green bird leave a white birch tree,

And it voices my sentiments, joyously-clear,
As it dines on the wing, SAME HERE! SAME HERE!



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.

Speeding Through Space

By ISABEL M. LEWIS

SIXTY to one hundred miles an hour on the surface of the earth, five or six times this rate in the air—this is about as fast as most of us travel on the face of this planet. Yet, compared with the rate at which the celestial bodies are speeding onward through space, this is like the crawl of a snail.

The moon is a very slow-moving celestial body, but it manages to get around the earth in its orbit with the speed of a cannon ball. The few who have seen the approach of the moon's shadow at the time of a total eclipse of the sun have described it as "startling" or "terrifying." This is because of the terrific speed with which it sweeps down upon the observer. It presents the one opportunity that the inhabitants of this planet have of direct contact with celestial motions. Yet the shadow of the moon moves very slowly as compared with average motion through space; its usual speed across the surface of the earth is about

half a mile a second. As it first strikes the earth at sunrise, or leaves it at sunset, it moves much more rapidly relative to the earth.

Meteors shoot through the earth's atmosphere at velocities ranging generally from ten to fifty miles a second, and are gone in a flash. Those that are not consumed by friction with the earth's atmosphere fall to the earth, however, with the average speed of falling objects, so greatly are they slowed down by the atmosphere. Their observed speeds through the upper atmosphere are not the usual ones of celestial objects, for they are relative to the earth's motion. These are slow when the earth is overtaken in their flight; fast when it is met "head on."

The various planets of the solar system, since they obey Kepler's Laws of Motion, move more rapidly in their orbits the nearer they are to the sun. Mercury travels in its orbit with a velocity that ranges from

36 miles a second, when it is closest to the sun, to twenty-four miles a second, when farthest from it. The earth attains an average velocity, in its yearly journey around the sun, of eighteen and one-half miles per second. Neptune, being one of the planets most distant from the sun, crawls along at the slow celestial speed of three and one-half miles per second.

No celestial body is completely at rest. In addition to a rotation about an axis within the body itself, and a revolution about the sun in the planetary year, all members of the sun's family of planets share in its motion onward through space. The entire solar system journeys through space as a unit, with the sun the central and dominant body. The sun itself rotates once on its axis in a period of about twenty-five days at the solar equator, and thirty-four days near the poles. The motion onward through the Galaxy, or Milky Way system of stars, of which it is a member, is at the rate of twelve miles a second, or four astronomical units a year, in which the astronomical unit is the distance of the earth from the sun, or 93,000,000 miles. The direction of this motion is toward the constellation of Hercules. Motion of any object is, of course, relative to something else, and in this case the motion of the sun is relative to the general average motion of the various groups of stars.

The general direction in which the sun is moving is called the Apex of the Sun's Way, and the opposite point in the heavens is called the Antapex. Observations show that in the direction of the Apex the stars appear to be drifting toward the sun; in the direction of the Antapex they appear to move away from the sun and halfway between they are neither approaching nor receding. By taking the mean of the motions of a large number of stars relative to the sun in all directions it is possible to cancel out their individual motions and to find not only the direction of the sun's motion but also its velocity.

Many stars travel together through space in groups or clusters. Most of the bright stars in Orion form such a group. This group is moving directly away from us with a velocity of about thirteen miles a second, and the average distance of its stars from our solar system is between five hundred and six hundred light years. Other well-known moving clusters of stars are the Ursa Major cluster, which includes in its members five of the stars in the Big Dipper between seventy and eighty light years distant, and other stars widely scattered through the heavens, including Sirius. The sun is in the midst of this cluster, but does not share in the motion of its members.

Other well-known clusters are The Pleiades, The

Praesepe, or Bee-hive, cluster in Cancer, and the huge Scorpio-Centaurus group, a huge assemblage of bluish-white helium stars, including stars in the Southern Cross as well as in the two constellations named. Many of the brightest stars belong to this group. Antares, Spica and Beta Centauri are well-known members, and the average distance of stars in the group is several hundred light years. The motions of the stars through space relative to the earth and across the line of sight are known as their "proper motions,"

and their motions toward or away from the observer are known as their radial velocities. It is possible to determine these motions by actual measurements of change of position, at intervals of several decades, in the first case, or by observations of shift in the lines of their spectra, in the second case. In both instances the motions of the stars can be found in miles per second. The results of such measurements show that all stars are in motion and tend to move in streams. Some move much more rapidly than others.

In general stars move through space at velocities that range from less than five to about forty miles per second. Stars that exceed a speed of forty miles a second are in the class of "runaway" stars. Most rapidly moving of all stars, so far as is known, is a faint star of tenth magnitude—known only by its Catalogue No. OA 14320—

in the constellation of Libra, which has the tremendous space-velocity of more than four hundred miles per second. Another star moving at the excessive speed of more than two hundred twenty miles per second is the eighth magnitude star in Cassiopeia, known as Helsingfor 956.

It has been found that certain types of stars and groups of stars possess high velocities. Certain variable stars, clusters of stars, and objects such as the Magellanic Clouds and Galaxies lying far beyond our own Galaxy are moving with great rapidity. The shift in the lines of the spectrum of a star, whether it is moving through space individually or in a far-away cluster or galaxy, gives the direction of motion and velocity of the body. It has been found that far-distant galaxies are moving at fantastic and almost unbelievable speeds. The Large Magellanic Cloud, which is approximately 40,000 light years from the plane of our own Galaxy, is receding from the earth with a speed of about one hundred seventy miles a second; and the Small Cloud, 60,000 light years from the galactic plane, is receding from us with a speed of about one hundred miles a second. These are the nearest to us of all the external galaxies, and their velocities are small com- (Continued on page 108)

Orion

By ELAINE V. EMANS

His Dogs forever
Dutiful,
He yet pursues
The fiery Bull

Across far reaches
Of the cold
Blue night as stanchly
As of old.

And, though his very
Belt be wrought
Of universes,
Brightly caught

In perfect poise,
Till worlds shall end,
He seems my old
And intimate friend!



Photographic Contest

Our *Dumb Animals*, official publication of the Massachusetts S.P.C.A., announces its annual photographic contest to obtain "story-telling" pictures of "wild life feeding or building homes, or of domestic animals in surroundings showing care and thoughtfulness for their comfort." A first prize of \$25 is offered, as well as twenty-two additional cash awards. The contest closes June 30, 1945. Space does not permit publication here of all details, but these may be obtained from Contest Editor, *Our Dumb Animals*, 180 Longwood Avenue, Boston 15, Massachusetts.

Nature Salon

Announcement is made by *Hobbies*, the magazine of the Buffalo Museum of Science, that its Seventh International Salon of Nature Photography will be held from May 16 to June 12, 1945, at the Museum. All Nature photographers are invited to submit their four best prints that fall within four classes. Complete conditions are available and entry forms that will be sent on request. The last day for receiving prints will be Sunday, May 13.

Chile Guano Study

Upon request of Chilean authorities and through the Inter-American Development Commission, William Vogt has been sent to Chile to assist in the scientific development of guano, a bird waste product valued as a fertilizer. For several years Mr. Vogt worked with the Peruvian Government in protection of the guanay birds, some 11,000,000 of which live on the islands off the coast of Peru. The birds are a kind of cormorant, and nest in enormous colonies. The necessity of protecting the birds was recognized long ago by the Inca Indians, who used the guano as a fertilizer many years before the coming of the Spanish conquerors. Mr. Vogt's survey in Chile will seek to determine the numbers of birds and their local habits, the availability of fishes they must have as food, and the protective system necessary.

Mr. Clapp Retires

After nearly forty years in Government service, Earle H. Clapp, Associate Chief of the U. S. Forest Service, is retiring from active duty. His early work in organizing and establishing the research program of the Forest Service made him widely known among professional foresters. The twelve regional forest experiment stations were organized under his leadership, and the work of the Forest Products Laboratory at Madison, Wisconsin, was greatly expanded while Mr. Clapp was in charge of research.

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Hepatica Triloba—(Liverwort)
Phlox Bifida—(Cleft Phlox)
Sanguinaria Canadensis—(Bloodroot)
Viola Blanda—(Sweet White Violet)
Viola Pubescens—(Downy Yellow Violet)
Viola Pedata—(Bird's-foot-Violet)

1 each or 8 plants for \$1.00
5 each or 40 plants for \$4.50
10 each or 80 plants for \$8.00

COLLECTION II

Spring Flowering—Height 16 to 30 inches

Aquilegia Canadensis—(Wild Columbine)
Arisaema Triphyllum—(Jack-in-Pulpit)
Aodecatheon Meadia—(Shooting Stars)
Geranium Maculatum—(Cranesbill)
Mertensia Virginica—(Blue-Bells)
Phlox Divaricata—(Sweet William)
Polygatum Biflorum—(Solomon's Seal)
Uvularia Grandiflora—(Bellwort)

1 each or 8 plants for \$1.00
5 each or 40 plants for \$4.50
10 each or 80 plants for \$8.00

COLLECTION III

Summer Flowering—Height 18 to 24 inches

Baptisia Australis—(Blue Indigo)
Eupatorium Coelestinum—(Blue Ageratum)
Liatris Scariosa—(Blazing Star)
Lobelia Cardinalis—(Cardinal Flower)
Lobelia Syphillicita—(Great Blue Lobelia)

1 each or 5 plants for \$1.00
5 each or 25 plants for \$4.50
10 each or 50 plants for \$8.00

COLLECTION IV

Spring Flowering—Height 6 to 12 inches

Trillium Cerneum—(Nodding Trillium)
Trillium Erectum—(Purple Trillium)
Trillium Grandiflorum—(Large White Trillium)
Trillium Recurvatum—(Prairie Trillium)
Trillium Stylosum—(Rose Trillium)
Trillium Undulatum—(Painted Trillium)

1 each or 6 plants for \$1.00
5 each or 30 plants for \$4.50
10 each or 60 plants for \$8.00

COLLECTION V

Spring Flowering—Height 10 to 16 inches

Cypripedium Acaule—(Pink Ladyslipper)
Cypripedium Pubescens—(Yellow Ladyslipper)
Cypripedium Spectabile—(Showy Ladyslipper)

1 each or 3 plants for \$1.00
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COLLECTION VI

Various Heights—12 to 36 inches

Adiantum Pedatum—(Maidenhair Fern)
Athyrium Felixfemina—(Lady Fern)
Botrychium Virginiana—(Rattlesnake Fern)
Dryopteris Spinulosum—(Toothed Wood Fern)
Osmunda Cinnamomea—(Cinnamon Fern)
Osmunda Claytonia—(Interrupted Fern)
Osmunda Regalis—(Royal Fern)
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NATURE
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The School Page

Edited by E. LAURENCE PALMER

Professor of Rural Education, Cornell University,
and Director of Nature Education, The American
Nature Association

SHADE TREES AND SCHOOLS

FOR many years school children have spoken pieces about trees on Arbor Day, and abused them the rest of the year. Trees have been "drawn and quartered" in art classes and in school shops. They have been "adopted" by classes, which watched the changes trees made during a year, and recorded the appearance of flowers and the disappearance of leaves in labored essays. They have been mapped. Their ages have been computed. They have been bled of their sap, stripped of their leaves and distorted to make grotesque horticultural caricatures of what a self-respecting tree should be. Poets have tried to appreciate them. Musicians have tried to interpret them. Business men have tried to profit by them, and children have enjoyed climbing in them.

Some of the school activities with respect to trees have been excellent. Others have been inane. One group of children in a midwestern city once wrote a series of essays decrying the fact that the poor trees had to stand all winter with their naked limbs exposed to the bitter winter weather. Even Joyce Kilmer, in his excellent poem, tried to personify a tree and put a nest of robins "in her hair," although why it would glorify any organism to have a nest of robins in its hair is hard for some of us to see, and why the place where robins nest in trees would be considered as hair is even more difficult to appreciate.

Boy Scouts and Girl Scouts have gone to great lengths in making truly instructive collections of woods of different species of trees, sometimes destroying useful trees in the process, and handcraft cranks have made spatter prints, blue-prints, smoke prints, and ink prints of tree leaves with varying degrees of success.

Study Suggestions

There are a few generalizations about tree study that seem to me to be important for any teacher to consider. Studies should be realistic and practical, or, if imaginative, they should lead to something constructively worthwhile so far as trees are concerned. It should be a perfectly legitimate school activity for schools to evaluate the kinds of trees found between school and home in an effort to determine whether the trees can be considered equally useful. If we must study the artistic beauty of a tree let us think about the appropriateness of a broad squat tree in a narrow street bordered by high buildings. If we think a catalpa tree is pretty when it is in bloom, or a horse chestnut tree yields attractive "nuts", then let us compare these trees with elms or maples as to the amount of trash they leave on the sidewalk beneath, or the degree to which they winter kill or are subject to distorting diseases. If we think a spruce tree is beautiful as an ornamental close against a house, let us see how many spruce trees growing along sidewalks become nuisances by dumping snow down our necks, or remaining dripping wet long after other trees have dried out after a snow storm or rain storm.

It is perfectly worth while to suggest that children learn that if they are to make collections of trees, or parts of trees, that they should not destroy the fundamental shape of the tree by breaking "leaders", nor should they normally collect so assiduously as to kill the tree unless it is an undesirable species. Above all, if they break off branches and twigs, they should learn how to do this so that no stub remains to serve as a possible entering point for some destructive fungus parasite.

It is an essentially useful activity for children to learn how to plant or transplant a tree so that it will survive the experience. It does not make sense to yank a tree out by the roots and then stick it into the ground at any old place in any old way and expect the tree to make up for the planter's ignorance. There are reasons why the roots should be spread. There are reasons why the evergreens should have their root systems kept in balls of earth. There are reasons why the good gardener trims the roots of transplanted trees, and also reasons why the tops are trimmed to prevent undue demands on the restricted root system of the transplanted tree.

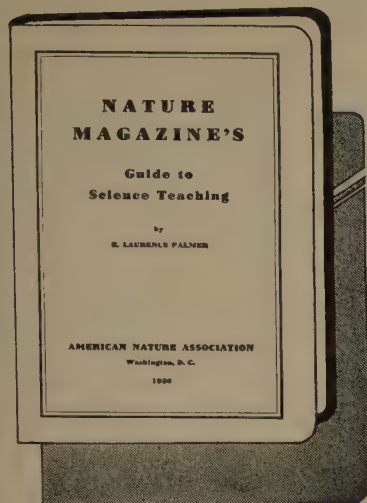
Read About Trees

It is a good experience to read some good literature produced by those who have loved trees. Enos Mills and his ancient pine, Anna Botsford Comstock and her *Trees at Leisure* are worth reading, and the state-wide programs carried on in Pennsylvania to mark trees that are oldest or historically significant are fundamentally fine. Even the Scout projects based on growing trees from nuts collected from famous trees may be worth elaborating. I know, in my own case, of a number of trees on my place that are significant to me because of the place from which they came. For example, I have a number of "gate trees" that I got from seedlings brought from New Harmony, Indiana. I like them because I know the story of how they happened to be associated with the New Harmony movement, so important in the growth of biological and sociological science in America. I always liked the idea back of membership in the American Tree Association, which made a common brotherhood of those who had successfully planted a tree and were therefore entitled to membership in the Association. If the tree planted has an historical or personal significance then why should not the experience of planting the tree be just that much more worth while? And how can we get some of this viewpoint without knowing what trees may have meant to others? Somehow when I visit the home of my grandfather, and see the row of Norway spruces he planted and the way he set out sugar maples in front of the house, and mountain ashes on a corner behind the house, I have a picture of the old gentleman that to me is much better than the one that hangs in a frame in my bedroom. I have some of those spruce trees' offspring in my yard, and my friends are constantly asking me for some of the mountain ashes that came from my ancestral stamping ground. The mountain ashes will be just some pretty woody plants to my friends, but they are much more than that to me.

Trees in Art

The educational insert in this issue of *Nature Magazine* is especially prepared to stimulate worthy school activities about trees. The pictures of the trees are presented in drawings of a more artistic type than is found in identification texts, and if these are studied with reasonable care they may yield suggestions to art teachers who feel that children should learn how to draw one of those most difficult of Nature subjects, a tree.

The tabular material is chosen to give the details regarding the nature and weight of the wood, the maximum height, and, in some cases, the details regarding the starting of the plants by the collection and planting of the seeds. It is hoped that school folks will examine this material carefully, particularly if the species is available for study in the immediate environment. If readers of this page persist in wanting help on the making of prints of one sort or another, and will record their wishes, we will try to meet their needs, either by correspondence or by material in subsequent school pages. It is hoped that artificial work may be avoided as much as possible, unless it leads to the gaining of really useful knowledge, and if you want to know trees, the best way is to go where they are, and learn from *them*, with the help of material that is really functionally important.



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Dutch Forests Destroyed

On the pretense that too many trees in Holland are being cut down by "incompetents," the Nazi authorities have issued an order prohibiting all transportation of wood without a special permit, according to Aneta, Netherlands News Agency.

Because the Dutch coal mines have been cut off by the allied advance, and the Germans refuse to send in relief fuel shipments from the Reich as reprisal against the railway strike, the Dutch are faced with an acute shortage of coal for the cooking of their pitifully meager food supplies and the heating of their homes. Many city dwellers have gone into the country to secure whatever wood they could find in the nation's forests. Now the Nazi authorities have prohibited the carrying of axes, saws and knives, and also issued a special order against the further cutting down of trees.

This action on the part of the Germans was not inspired, however, by any concern for the future of Holland's forestry. The invaders themselves have completely obliterated some of the nation's best timber, for war purposes. In Haarlem, for instance, the German Army completely razed a beautiful natural park, the famous "Haarlem Woods," to permit the construction of anti-tank ditches. Inhabitants of the surrounding areas were rounded up and forced to cut down every tree of the centuries-old forest of which they were so proud. The same wanton destruction was applied to the "Woods" near The Hague, and some fine forests in eastern Holland.

With great areas of farm land already devastated by indiscriminate German floodings, this added destruction means further disastrous losses to Holland's agricultural life through erosion. The people have been well aware of the danger. One underground newspaper, the *Vrije Nieuwscentrale*, indignantly urged Netherlands to sabotage these German devastation plans in every possible way, disregarding all necessary sacrifices and dangers. "Felling those trees threatens the very existence of the Netherlands people," the paper warned.

Before the Nazi invasion, forests covered about seven per cent of the total surface of the Netherlands. For many years the Dutch have been making efforts to increase their wooded areas. In 1888 the Netherlands Heather Association was formed for the purpose of converting waste lands into forested regions. The government contributed regular sums to aid it in its work. Over a period of thirteen years this organization had reforested 27,000 acres of otherwise valueless land. All this work has been made useless through the lust for destruction on the part of the enemy. It will take Nature and man many years to repair the damage caused by such wanton action.



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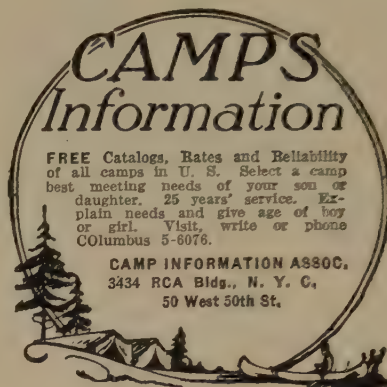
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TRAVELS ON A LEAF

(Continued from page 68)

fallen apples, dozed there, anchored in place on the red surface of the leaf.

By late November, all the twigs of the wild-cherry clump were bare—bare as they were on that day when first I noticed them during the caterpillar invasion of early June. Fall rains first stripped the yellow leaves from the swampside maples. In the open spaces and among the grass-clumps about the wild cherry bushes, their gold turned to brown. The whole foot of the slope became a sea of dry fallen leaves, a sea that broke into eddies around the grass clumps, and piled up in waves against the windward side of the bushes. Then came a night of cold and driving storm. The twig-tip leaf, that tiny continent on which I had traveled during the long summer days, was torn from its moorings. Like some diminutive lost Atlantis, it disappeared into the sea of leaves below it.

FROST DANGER TONIGHT

(Continued from page 72)

degrees higher than that on the ground. On the other hand, a town with an unfavorably located thermometer will always stress that fact in connection with its weather advertisements.

Peninsular Florida is divided into ten different frost warning districts, containing a varying number of stations, the total of which is eighty-one. There is a Weather Bureau field meteorologist in each of these districts. Two forecast bulletins are issued each day from the central station, one in the morning and one in the late afternoon. Records are kept of the accuracy of these forecasts and, during the 1943-44 winter season, Florida's Head Frost Meteorologist Johnson hit the minimum temperature on the nose 95.3 per cent of the time in a total of 12,312 forecasts issued. He came within two degrees of the minimum 98.7 per cent of the time.

Florida frost warning men lead a double life. Meteorologist Johnson is at the Lakeland office from the middle of October to the middle of June, while from the end of October to the end of March the field meteorologists are stationed at inland points where they check on the cold and work for the benefit of Florida's citrus industry and truck farmers. Soon after June 15, the men move to stations along the coast, from Florida to Texas, and, during the summer months, they watch for hurricanes. Johnson works on hurricane forecasts from the Miami office of the Weather Bureau.

California's Fruit-Frost Warning Service is older than Florida's. In both states weather men visit the groves and give ad-

vice as to the most efficient ways of placing heaters. They also check thermometers, for many grove owners have a number of thermometers at various places through their groves, and these must be checked for accuracy at the beginning of each frost season. The Weather Bureau recommends a special little shelter for each of these.

California does more grove heating than Florida does. A ten-year average showed that heaters were burned in California groves for about twenty-nine hours a year while the Peninsula State's average was much lower. But there are times in both states when heating is extremely difficult. When a biting north wind sweeps across the country, no amount of heating can save all of the fruit. However, experience has shown that heated groves will come through with much less damage than will those that are left unheated.

The weather man can make a definite forecast for a period of about twenty-four hours, plus a "future outlook" giving in general terms the temperature conditions that may be expected for the next four or five days. Beyond that he cannot go. Not even the best weather man can know for certain what to expect a week hence in the way of sky conditions, wind force, humidity, rate of temperature fall, and the numerous other weather aspects that must be considered in making an accurate forecast.

Long range forecasts on a scientific basis are still impossible. Of course almanac writers of the Colonial period, as well as "prognosticators" of the Middle Ages, blithely predicted weather conditions for a year in advance. The almanac maker who scored a lucky guess would enjoy popularity and prosperity—extra editions of his almanac would have to be printed to meet the public demand. If, on the other hand, he missed his guess, he could always say his prediction did not apply to that particular locality.

Weather forecasting is very old—Assyrian astrologers and magicians made a specialty of weather predictions. So did the Greeks and Romans—only instead of watching the sky, they often examined the entrails of animals to find out whether it was going to rain tomorrow.

Grove heating, too, is an old practice. Roman farmers used smudges to ward off the noxious influences of heavenly bodies. The Incas of Peru heated their fields long before the Spanish Conquest. Fifteenth century French farmers did the same, although they had no efficient Weather Bureau to tell them when this would be necessary.

Until a few years ago, grove owners believed that a "blanket of smoke" would keep the heat in their groves. But today the weather man has taught them better. On cold nights a condition known as "temperature inversion" often exists. The warm air rises and forms a layer a short

distance above the ground. The cold air settles and, in low spots, it forms what are known as "frost pockets." If the cold air on the ground can be warmed enough to cause a circulation, bringing the warmer air back to earth, the weather man knows that the fight against the cold can be successful. Thus, he advises the use of heaters that are comparatively smokeless. It is the heat, not the smoke, that wins the battle.

People who scoff at the weather man are the ones who forget the many times his predictions are correct and remember only the few times he misses. Still, his record for accuracy is so high that the wise grove owner and truck farmer, as well as the packer and shipper, listens with respect to the weather man's frost warnings.

Manila Hemp Progress

Abacá, or Manila hemp, was one of the essential products cut off by the Japanese occupation of the Pacific Islands, particularly the Philippines. Immediately after Pearl Harbor production was stimulated in the Western Hemisphere, with the result that in 1945 Latin American growers will turn out a substantial supply that, while not all that is needed, will greatly relieve the situation. In the Philippines, abacá was not usually harvested until the plant was about three years old. Central American growers, coached by American plantsmen, have been doing better. Giving the plants better care, they have advanced the harvest period to less than two years after planting. Fortunately an American-controlled tropical fruit company had been experimenting with abacá for several years. It is a crop that is suited to some of the Central American lands where banana growing has been abandoned because of the spread of banana disease caused by a fungus. Panama, Guatemala, Costa Rica and Honduras are producing important additions to the shrinking stockpiles of this important fiber.

Many Thanks

A few months ago we carried a little note saying that Mrs. J. Frank Key of Buena Vista, Virginia, was anxious to obtain some bird nests for use in bird teaching in Virginia schools. The response from our readers was splendid, many nests being contributed. Mrs. Key reports that she has struck up a wide friendship as a result of this fine help. She is, however, a little disturbed because one nest came without any address of the sender on it, so she was unable to express her thanks. She could not quite make out the State of origin, although she suspects it was Minnesota. If the person who sent the nest reads this he, or she, will know that the gift was appreciated.

THERE ARE SUCH THINGS

By MYRTIE B. GERARDY

In the sunny southland, the hand of Time pointed to spring, with quite a leaning toward the lushness of summer. We were made doubly aware of the season for our own redbirds, Jim and Judy, came flashing through the air with brave calls and twitterings, seeming to say, "Hello, Folks! Glad to see you. It's great to be back home!" Where they had been sojourning, we shall never know. That they were really Jim and Judy we knew, for, aside from their vociferous "hellos", Jim had one peculiar toe and Judy's left wing was a little tilted. The year before, they had nested in one of the tall shrubs.

Our two-story house seemed to be a favorite spot as it was surrounded by trees. Owing to the way the stairway was built, there was a projection on the north side of the house. A trellis with a lovely climbing rose bush extended from the ground to the outer edge of this projection, and, in this suburban retreat, they quickly started to set up housekeeping. Back of the rose bush was the sliding pantry window. Redbirds are by nature extremely shy. It never occurred to us that they would build their nest so close to human observation. But birds, like man, seem to learn by living. The year before was disastrous for them as a cat had climbed to the nest. This year they evidently planned for protection.

So build, they did. By common consent, the window was never opened from that time. At first, if anyone looked out the window, Judy would flutter away. The nest was close to the glass. Finally, her only notice of our presence would be a beady stare, and the feathers along the back of her neck would ruffle like a little setting hen's.

During the incubating time, Jim was simply delirious with happiness. He would perch on a limb close by and simply pour out his heart with, "I'm here! She's here! What cheer!", and a warble that probably meant, "The babies will soon be here." We noticed quite often that, after feeding, Judy would place herself in the nest so she could watch all his preenings, caperings, and air-somersaults—the Eternal Male showing the lesser of the species how wonderful he was.

The babies arrived on time, but there were only three—two husky youngsters and one tiny one, the exact likeness of the mother bird, but so fragile. We feared she would not receive her share of the food and be trampled. However, again we had not fully gauged the almost-human watchfulness of Jim and Judy. Whichever parent served the meals would manage to push the greedy ones aside, and little Judy's wide open mouth was always filled.

The little birds were nearly ready to

fly when, one day, Judy flew away to attend to her housewifely errands. She never returned. Jim grew more restless as the afternoon waned, and in between feedings the air became filled with his frantic twitterings. Fearing a snake, the family armed itself, but there was no snake. It was then that we missed Judy. Dark was approaching. No one thought of leaving until he knew how Jim would manage the difficult situation. After flying back and forth until it seemed he could fly no more, he settled on the side of the nest. With a plaintive chirp he stepped into the nest with wings spread wide.

The weather next day was perfect. Early in the forenoon, someone next door called, "Jim is teaching the little birds to fly." That called for all hands to help keep wandering cats away. There was a tree on the back of the lot with dense foliage and a crotch just right for birds leaving the nest. Jim soon disposed of the two husky ones, but with little Judy it was a different story.

Cajoling notes, sweet chirps showing her she had nothing to fear—still she was in the lower part of a shrub not far from the nest. An arrogant mocking bird must have thought the humans standing so quietly at different places in the yard were statues. Down he swooped, intent on causing trouble. He flew too close to little Judy and a meteor of red feathers struck him. Jim drove him to the edge of the yard, then came back to the job at hand.

The only amusing happening was Jim's behavior when the mocking bird, after smoothing his ruffled plumage in the top of a near-by tree, started his trilling song. Jim would puff his feathers and cast a baleful eye upward and then with a shrug, he would turn his attention to little Judy.

Two hours passed and little Judy was still quite a distance from the chosen spot. Jim sat on a limb, the picture of abject despair and exhaustion. His beak was open, wings drooping. We held our breath wondering if he was going to give up. All at once he sat up, shook his feathers, stretched first one leg then the other, as if to be sure they were in working order, then redoubled his cajoling address, fluttering slowly from the little bird to the tree, back and forth. Suddenly, as if seized by an inspiration, little Judy gave a delighted chirp, a flutter of the wings and followed Jim into the greenery and out of our lives.

It was a subdued family group that slowly entered the house. As if by common consent, all footsteps turned toward the pantry, once again to view the nest through the window. It was a memento of a force far superior to mere human endeavor. We had seen idyllic love and companionship; had been a party to unforeseen tragedy; and had witnessed infinite care, patience, adherence to the

(Continued on page 109)

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(Continued from page 96)

unwary. Discouraged in this, he took to hanging around the owl cage. Chased away from there for his own safety, he went off in a black sulk, only to return with four crow friends. Now, from the trees on the lawn, they carry on an uninterrupted crow cheering section from dawn to darkness.

It might be expected that the Allen family would sometimes long for a nice peaceful weekend in a boiler factory. One little incident disproves it. The house had suffered two sparrow hawks for a considerable period. One disappeared. Before the other found time to mourn or feel neglected, Phebe, the Doctor's daughter, as daughters will, married. Tactfully queried as to her desires in wedding presents, she immediately chose the remaining hawk.

Where do all these pets come from? Well, Allen is the "Bird Man," the consulting specialist to the great unnumbered proletariat of bird observers of the countryside. Any young or injured bird picked up soon finds its way across his desk. For this, he has only himself to blame. It is not possible to encourage a community to become aware of birds, to ring up about the unusual ones, and still retain privacy. This practice nearly felled Allen one year. A graduate student, studying bird behavior, fastened bright orange and red feathers to the tails of captured sparrows. When they were liberated the Professor's phone went on a twenty-four-hour day.

All this leads to what has been termed "The Man's Backyard Potency." It works in this manner. Imagine yourself as one of two students, stealthily threading your way amidst the vegetables and flowers of a residential garden. Suddenly the kitchen door of the house erupts and a menacing, belligerent housewife transfixes you with an uncompromising glare.

"Just what do you think you're up to?" she inquires in a wintry tone.

"Why-y . . . we . . . that is . . . well, we were sort of looking for a bird"

"Humph! Indeed?"

"Honest, Ma'am. We were going down the street and we heard a cardinal whistle, and we slipped in here to see if we could spot the nest. We'll leave."

"A cardinal? Do you mean one of those red birds?"

"Yes, Ma'am."

Hostility deserts a losing cause. The woman comes down a step or two.

"Are you students of Professor Allen's?" she asks.

"Yes, we are."

"Well for goodness sake, why didn't you say so!"

The next thing they knew, they were cozily ensconced in the kitchen, discussing, over cookies and cocoa, all the birds that had whirled through that locality

within the past decade.

One side of Allen's character should not escape note. He is a practical ornithologist. He can see both sides of a question. He is not prone to plead sentimentally for every stray plague of starlings that invades a cherry tree. Moreover, he is an ardent, skillful hunter. With his experience, you can guess how often he returns empty handed.

There is one uncertain factor in his hunting, though. That is his pointer, Fang. As a bird dog, Fang leaves nothing to be desired; in his other activities, he leaves room for considerable embarrassment. This result stems from his social inclinations. Fang is what is known as a good mixer. When the Naval Trainees appeared on the Cornell Campus, Fang adopted them for his own. They reciprocated. In fact, they went further. They initiated him into all of their most garish and exclusive orders. One day he comes home with his tail striped like a barber's pole, the next with a chief petty officer's insignia painted artistically on each flank.

Last, in closing, if I should offer my own estimation of Allen, I can do no better than to quote the words once said of Louis Agassiz Fuertes: "A man of simplicity and genuineness . . . appearing to have something in common with people in every walk of life and all ages, and always it was the best in them to which he appealed; he was instinctively helpful, the requests for his assistance seemed unlimited, yet always he dropped his own work to respond to them."

SPEEDING THROUGH SPACE

(Continued from page 102)

pared with that of the metagalaxies, which lie at distances of tens of millions of light years. If the red shift in the lines of the spectra of the metagalaxies are to be interpreted in the same way as for nearer objects in or close to our own galaxy, these are the most rapidly moving celestial objects known. All of them are extremely faint objects receding from the earth with velocities that average one thousand miles a second at a distance of ten million light years, and much higher for more distant galaxies. Most of the studies of these objects are made with the big reflectors at Mt. Wilson, for they can be seen only in the most powerful telescopes. The magnitudes of the great majority of them lie between the 17th and 18th magnitudes and they are therefore extremely faint objects.

It is an interesting fact that galaxies as well as stars rotate about an axis as well as move onward through space. Our own galaxy has been described as watch-shaped, with the constellation of Sagittarius near the center. The solar system, a unit in the great aggregation of stars of which it consists, lies at a distance of

some 30,000 light years from this center. The cosmic year, as it is called, or the period required for a revolution around the center of the galaxy at our distance from it, is estimated to be about two million centuries. The watch-shaped galaxy itself has dimensions of something like 100,000 light years in length, and 10,000 light years in thickness.

The planet Venus will be at its greatest distance east of the sun on February 2, when it will set more than four hours after the sun. It is the most brilliant object in the western evening sky and will increase in brightness during the month. Mercury will be in superior conjunction with the sun on February 28, and will not be favorably placed for observation at any time during the month.

Mars is now in the morning sky, passing from Sagittarius into Capricornus. It is visible in the southeast before sunrise. Jupiter is in Virgo and rises about nine P.M. in the middle of the month. It surpasses all other planetary and stellar objects except Venus in brightness. Saturn is now well-placed for observation in the evening sky in Gemini, and is a beautiful telescopic object at this time as its rings are still nearly at their widest opening. It resembles a pale yellow star of the zeroth magnitude, exceeding Capella in brightness.

One Hundred Years

Congratulations to our distinguished contemporary, *Scientific American*, which, with its issue of January, 1945, observes its One Hundredth Anniversary Year. In the century that has elapsed since the founding of the magazine in 1845, tremendous scientific progress has been made and recorded in its pages. In the leading article in the January issue Charles F. Kettering traces the history of scientific research that has brought about such great changes in our way of life.

Dedicates Cork Oak

Marking what is hoped will be the beginning of a new Florida industry, Governor Spessard L. Holland was the principal speaker at the dedication of a cork oak tree planted on the capitol grounds at Tallahassee. Plantings made experimentally during the past three years indicate that this tree, native to the region of the western Mediterranean, will prosper in Florida. In addition to providing cork for everyday use, the tree is also an evergreen of ornamental importance, provides wood of value for cabinet work, and its acorns have possibilities as hog forage in forest plantings. About 4000 seedlings are available for planting this year, having been grown at the Olustee nursery of the Florida Forest and Park Service.

THERE ARE SUCH THINGS

(Continued from page 107)

right and determination to carry on that right in spite of great odds. All at once it came to me that the combination of all these things in bird and man is the ever true, beating heart of our great America.

Game Management

Of particular interest to those working in game management, and to students of birds and their habits, are two bulletins issued by the Illinois Natural History Survey. The most recent one is *Duck Populations and Kill*, and is a report of studies of the waterfowl regulations and their effect in Illinois. It is the work of Frank C. Bellrose, Jr. An earlier bulletin, which we had not previously had an opportunity to note, deals with two subjects. Part of it is devoted to a discussion of "The Prairie Chicken in Illinois", by Ralph E. Yeatter, and the rest of "Preferential Rating of Duck Food Plants," the joint work of Mr. Bellrose and Harry G. Anderson. These are, respectively, Volume 23, Article 2, and Volume 22, Articles 4-5, of the Survey.

Paris Science Exhibit

During the battle for the liberation of Paris the "Palais de la Découverte," which was housed in the Grand Palais de Paris, was partly burned by fire started by the Germans. This was an exhibit, established in 1937, reenacting famous experiments of science, carrying them out and explaining them before the eyes of visitors. Most of the fifty rooms that housed these demonstrations have been restored and are now ready for exhibition, offering opportunity for visiting G.I.s.

1945 Gardens Needed

A call to all Victory Gardeners to keep up their good work in 1945 has gone out from Washington. The War Food Administration says that gardens will be just as necessary in 1945 as they were in 1944.

A few months ago when the Allied armies were sweeping across France at a rapid rate, many assumed that the war would be over by Christmas. At that time there was some doubt about the need for a full scale Victory Garden program in 1945. This gave rise to rumors that the Government had lost interest in Victory Gardens. Any doubt about the need for gardens has been cleared up by the events of the last three months.

A survey by the Department of Agriculture estimates that there were 18½ million gardens grown in 1944. About 6 million of these were on farms and the others were in towns and in cities and their suburbs. The survey showed that 88 percent of all farm homes had gardens, and 44 percent of urban homes.

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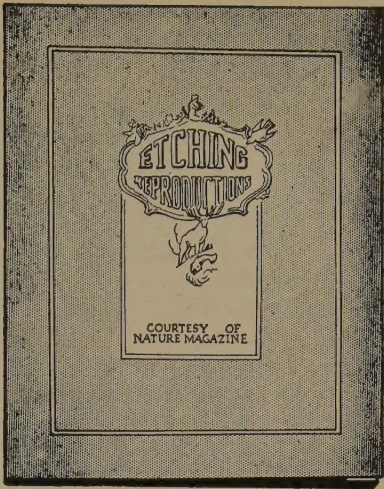
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By JULIAN D. CORRINGTON

HAIR

IN OUR article on teeth last month, the point was made that a tooth is actually a dual structure, the outer enamel coming from the epidermis of the skin, while the inner dentine is mesodermal bone. This is a strange concept for an organ so compact as a tooth, but a similar state of affairs for an object as small and as numerous as a hair is far stranger. One estimate states that there are about one hundred and twenty thousand hairs on the average human scalp, or at the rate of eight hundred to the square inch, yet each one of these tiny objects is a complete organ and goes through an amazingly complex developmental history, involving both epidermis and mesoderm. Moreover, although symbolic of fineness in diameter, each hair has many parts and is supplied with erecting muscles, oil gland, sheaths, blood vessels, and nerves. Perfectly astounding, this complicated organization in miniature—and very well worth while as a chapter in microscopy.

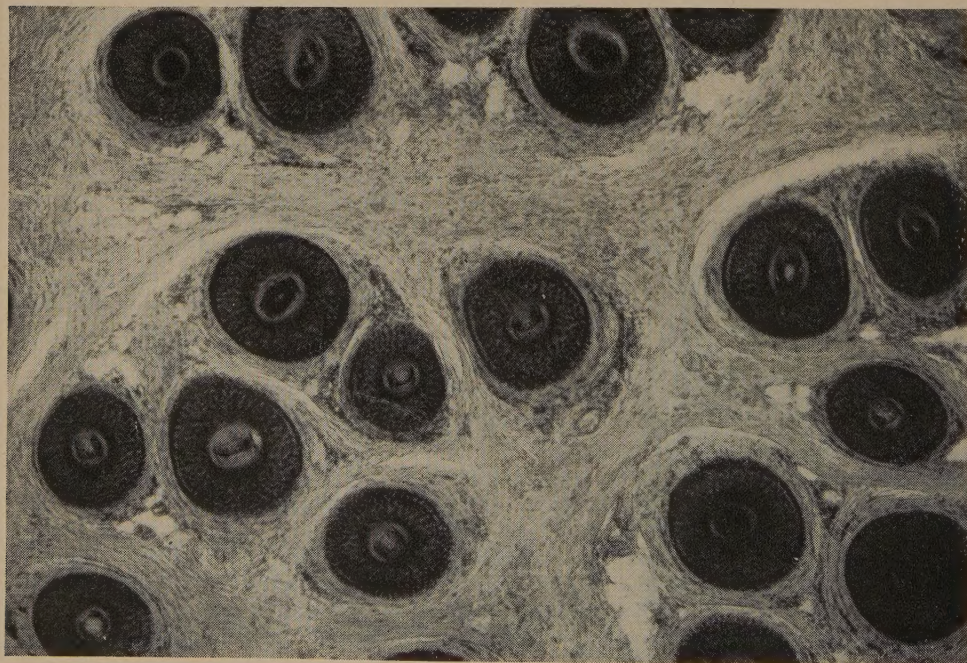
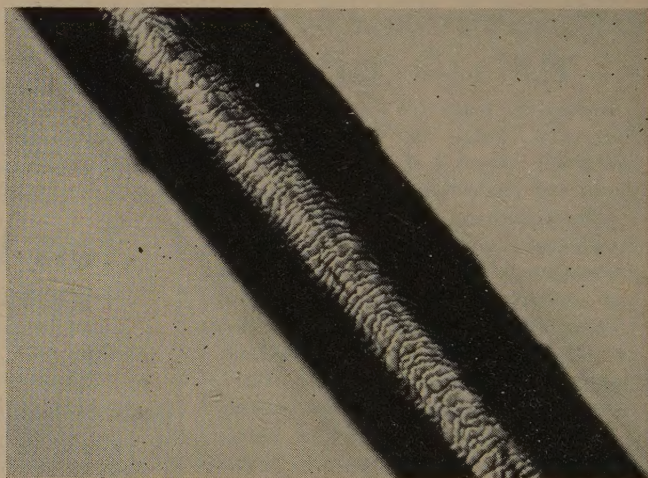
True hairs should not be confused with structures given this name in plants, worms, insects, or other lower animals; they are confined to mammals and are diagnostic of that class, all mammals having a coat of hair at some stage of life. The hippopotamus and rhinoceros sport a few bristles at the corners of the mouth, while in elephants there is a sparse general coat and a tail tuft resembling heavy wire. Man has an inconspicuous covering of hair over practically the whole surface of the body except the palms, soles, and red border of the lips. In all of these and other apparently or partially naked species, as in whales, the fetus, late in its development, has a partial or a complete and dense covering of fine hair, the lanugo, that is shed shortly before or after birth; in man during the eighth and ninth months.

The total coat of hair is termed the pelage, a companion term for plumage in birds. Many Arctic land mammals are nearly pure white, while some of north temperate regions, as the weasel and varying hare, are brown in summer and white in winter,

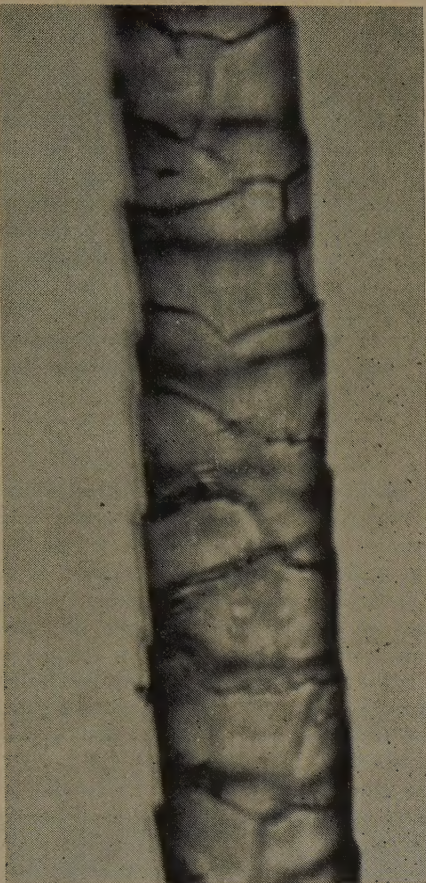
molting in spring and fall. Horses, cattle, lions, and many other of the larger mammals have a complete and often heavy pelage that does not differ essentially from that of smaller species save in texture, yet is not termed fur. By fur we generally mean hair that is fine and soft and grows thickly, and commercial value is implied. Actually there are two kinds of hairs in most fur-bearing animals: a soft underhair of furhairs, and long coarse overhairs, termed guardhairs; in fox pelts it is the gloss and color of the guardhairs that is most desired, while in muskrat these are plucked or sheared away and the furhairs clipped to a short length and dyed black, for example, to make "Hudson seal." Wool is a kinky form of furhair, the guardhairs having been bred out by long selection and crossbreeding of sheep.

Modified hairs are many in the world of mammals. Eyebrows and eyelashes are specialized forms in man. Long and stiff hairs, as in pigs, are termed bristles; if very large, strong, stiff, and sharply-pointed, as in hedgehogs and porcupines, they are spines. They may agglutinate into great hard tufts, making the horn of the rhinoceros; they may become delicate sense organs, with a specialized blood and nerve supply, to form the sinus hairs, more often termed the vibrissae or "whiskers" of the cat or rat.

In the various races of mankind, the head hairs may be flat in cross section and kinky in texture, as in Negroes; oval in section and curly or wavy in texture in Caucasians; or round in section and coarse and lank in texture in Mongolians. Hair has been well preserved, even as to color, in Egyptian mum-



Above, scales of human hair, oblique illumination, magnified 140X. At left, horizontal section of human scalp, hairs in cross section in their follicles. Magnified 80X. Photomicrographs from slides courtesy of Ward's Natural Science Establishment.



Bat hair, showing curious sculpturing of cuticular scales. Magnified 1140X.

mies. Definitive hairs are those that grow to a certain length and are then constricted at the base. The blood supply is cut off and the dead hair shaft loosens and falls out. Angora hairs are not so constricted and grow continuously. Thus in man, the body hairs are definitive, the head hairs angora.

If all the hair of a human head were removed, the skin of the head surface would be found pitted with a vast number of tiny tubes, the hair follicles, that penetrate the scalp to the depth of half-an-inch. This picture reveals the nature and mode of formation of a hair, which begins in human embryos of five months as a localized thickening of the epidermis to form an epithelial column that pushes down at an oblique angle into the surrounding mesenchyme. The lower end of this column enlarges to form the bulb and this inverts, the terminal cells starting a growth back up toward the surface through the center of the column, as when the tip of one finger of a glove is pushed back up through itself to turn the finger inside out. The hollow thus left at the tip is invaded by the surrounding mesenchyme, as the hair papilla, from whence comes the blood and nerve supply and which constitutes the growing center for production of a hair. In disease or after shedding, if the papilla is intact a new hair will form; if destroyed, no hair will be produced.

The central core, growing up from the bulb, now separates from the outer cells, these becoming the outer sheath of the hair while the core forms the inner sheath and the shaft, or hair proper. Midway of the follicle and on the lower side of the slant, the sebaceous or oil gland arises as a swelling of the epithelial column and marks the place where the inner sheath cells begin to degenerate, the shaft from this point upward being surrounded only by the outer sheath. Near the surface the central cells of the originally solid column degenerate, thus leaving a hair canal, which the growing shaft follows on its way to the outer world. In the adult, the term shaft is applied to all of the hair that projects away from the scalp, while that part imbedded within the skin is the root. Later a connective tissue sheath forms around the outer epithelial sheath of the root.

The arrector pili muscle, a bundle of smooth muscle fibers, runs from fibrous tissue near the top of the dermis downward on an oblique slant to pass alongside the sebaceous gland and insert below it in the connective tissue sheath of the follicle. Contraction of these muscles, which is purely involuntary and concerned with emotional states and the weather, presses against the sebaceous gland and causes a more copious flow of oil, but mainly serves to pull the hair into an erect position. When cat meets dog, the combined action of the arrectores pilorum in the cat's tail and the dog's mane causes the familiar bristling, designed to make their owners appear larger and more formidable and displays their emotions at this encounter. Sudden drafts of cold air will make the hairs rise so as to increase the amount of insulating dead air space between the hair coat and the skin. In man, goose flesh or goose pimples are the only survival of this mammalian behavior, the hairs standing up in response to cold air as if to aid in protecting the body, and also in response to sudden strong emotions, as fear or anger. It is indeed true that great and unexpected fright can cause one's hair to "stand on end."

The sebaceous glands are masses of epithelial cells clustered around the follicle. They produce an oily secretion (sebum) through the death of central cells with their contained droplets of oil. This serves to dress and lubricate not only the hairs but the general skin surface as well.

Thus the entire apparatus concerned with a single hair is of a dual nature, epidermal and mesodermal, and with complex parts and adjuncts. The hair proper, or shaft, root, and bulb, is entirely epithelial, and becomes completely cornified or keratinized, a process of disintegration of living epithelial cells as ever larger amounts of keratin, a form of horn, are deposited within them. Fortunately, the shaft of a hair is a dead

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structure; otherwise a trip to the barber would be a more painful experience than one to the dentist. A hair grows from its base and the process of cornification is progressive upward; hence the oldest part of a hair is at its tip. The rate of growth of head hair in man is said to be an inch per month or a foot in one year; the duration of a single hair averages four years, after which it falls out and is replaced in a new one.

The characteristics of hairs are so many and variable that they are becoming increasingly important in personal identification and criminological studies. Probably they will take their place as second only to fingerprints in this sort of work and may often be found at the scene of a crime where fingerprints may be absent, as when a few hairs are discovered on an automobile bumper in a hit-and-run homicide case. Sometimes a positive identification can be made from a single hair, or even a small fragment of one hair; at other times the evidence is inconclusive, yet students of trichology, as the science of hair study is termed, have hopes that with further refinements, hair identification may become as definite and certain as is the case now with fingerprints.

The best portion of a hair to study is the middle third of its length; its characteristics are all fully formed, yet not frayed or mutilated through environmental wear. The parts of a hair shaft are an outer cuticula, a wide cortex, and a narrow central medulla. The cuticle consists of great numbers of minute, structureless, transparent, imbricated scales, the apices pointing toward the tip of the hair; the overlapping of the scales reminds one of shingles on a roof or of scales on the body of a fish. As shown by the numerous studies of Professor L. A. Hausman, the size, pattern, and sculpturing of these scales is specific, identification of the species being generally possible from their inspection. This work has played an important role in detection of spurious fur garments. Bat hair is the most interesting of all types for its complex scales and has long been a favorite with the microscopist.

Second in importance for identification studies is the medulla, not always present. It is apt to be absent near the tips of all hairs and from such fine hairs as those of bats. An interesting correlation has been made between medulla types and hair diameter in human specimens. This part of the shaft consists of masses of cubical cells with degenerating nuclei, filled with kerato-hyalin and usually arranged in a double row, but there are many variations.

The cortex appears almost structureless. Near the base, its cells are typically epithelial, soft and round, but as growth proceeds they elongate to form spindle-shaped, fibrillated cells with linear nuclei, and keratinize so that by the middle third of the shaft the cortex seems to be a solid rod, translucent, and with only faint striations here and there to mark the site of former cell boundaries.

Pigment, in all colored hairs, may be diffused like a stain through the entire cortical substance, but is more often present in the form of definite pigment granules in either or both cortex and medulla. The cuticular scales are never colored. The pattern of pigment granules is often diagnostic and an important aid in identification. Finally, attention is now being centered, by Hausman and other specialists, on another very fine component of hairs, the fusi, great numbers of which may occur in the cortex. Form, size, arrangement, and number of these cortical fusi may become, it is thought, the most important of all hair characteristics for personal identification from unknown samples. As the cells of the cortex grow and change from cuboidal to fusiform, intercellular spaces filled with tissue fluid are compressed along with the cells into minute fusiform areas. When the fluid has gone, these spaces, the fusi, become filled with air and will appear black under microscopic examination because of refraction of the transmitted light. Gray hair will result from loss of pigment granules with advancing age, but white hair requires, in addition, the presence of many fusi.

A hair is prepared for study under the lens by a thorough cleansing in a grease and dirt solvent, as ether-alcohol or xylene, then placed on a carefully cleaned slide and, when completely dry, capped with a very clean and perfect cover glass. Low power and oblique, incident illumination (reflected light from above and one side) will then reveal the cuticular scales. Next the cover glass is removed and the hair mounted in a clearing oil, as xylene or oil of bergamot or wintergreen. When the cover is replaced on this wet mount, transmitted light is employed with low power to observe the medulla, and with high power for the pigment granules and fusi. These various structures are at different levels and so cannot all be seen at the same time or at one focal plane. Likewise illumination that will reveal some of them will obscure others, hence the necessity for the varied treatment.

TRADE NOTES

Volume IV of the Handbooks of American Natural History is entitled *Aquatic Plants of the United States*, and is by Walter Conrad Muenscher, Professor of Botany in the New York State College of Agriculture, Cornell University. As the author states in his preface, monographs have been prepared for only a few groups of aquatic plants covering the whole United States or for any considerable part thereof. The present manual results from many opportunities to study and collect in every state of the Union, crossing the continent eighteen times since 1914, and includes both submersed and emergent species of our fresh, brackish, and salt waters.

The introductory chapter deals briefly with the distribution, reproduction, vegetative propagation, fruit and seed production, storage and treatment of seeds for planting, and weight of seeds of aquatic plants. Then follows the bulk of the book, with first a key to the families, then aquatic plants arranged by families, of which fifty are considered. Keys to genera and species occur in turn, with diagnoses and descriptions of each taxonomic group and, in many cases, notes based on field observations of variability, special habitat requirements, special uses, or other features. Nearly all of the splendid, mostly full-page illustrations are original line drawings, and each species description is accompanied by a small inset map showing its distribution by states. References to the literature are given, along with a glossary. The book is a marvelous piece of work, beautifully executed, that will fill a decided gap in the handbook literature. It will prove indispensable hereafter for all those doing work in aquatic biology, and an especial boon to ecologists who are not themselves aquatic botanists. Pp. x, 374; pls. 157, maps 400. Comstock Pub. Co., Ithaca, N. Y., 1944. \$5.00.

Are you one of those people whose pets are chiefly herpets? Now do not tell us you wot 'not of the herpet! Herpetology is the study of amphibia and reptiles, from the Greek for a creeping thing, and so the herpetophile, made clannish by the looks of askance directed his way by the remaining and benighted portion of humanity, will rally round at the announcement of Percy A. Morris's *They Hop and Crawl*.

The author is chief preparator for the Peabody Museum of Yale University, is well known as a Nature writer, and has traveled and studied his subjects at first hand throughout North America. He writes with conviction and charm and includes an abundance of good illustrations. The chapter headings show the plan and content of this volume: Snake Fallacies, Harmless Snakes, Poisonous Snakes, Crocodilians, Lizards, Turtles, Toads and Frogs, and Salamanders. No attempt is made to include every species in the North American fauna; rather attention is concentrated on well-known forms apt to be encountered by the average field student. Appearance, habits, distribution, and economic value are included in the descriptions. Pp. xiv, 253; figs. 90. The Jacques Cattell Press, Lancaster, Pa., 1944. \$3.50.